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THE ZOOLOGIST:

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OF

NATURAL HISTORY

AND

JOURNAL FOR RECORDING FACTS & ANECDOTES

RELATING TO

**QUADRUPEDS, BIRDS, REPTILES, FISHES, ANNELIDES,
INSECTS, WORMS, ZOOPHYTES, &c.**

**THEIR HABITS, FOOD, RETREATS, OCCASIONAL APPEARANCE,
MIGRATIONS, NESTS AND YOUNG.**

Nos. CLXXIV. & CLXXV.

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TO CORRESPONDENTS.

A further portion of the matter in hand is already in a state of forwardness. I hope, by the liberal use of small type, to clear off arrears before long. There will be no more double numbers during the year.

The time for prepayment has ceased.

Entomologists will see that the ordinary mode of arrangement has disappeared with the appearance of their papers. The April number will be the richest in Entomology I have yet published.

Dr. Knox's "Zoology" and Mr. Atkinson's "Reason and Instinct" will appear with great interest; the latter subject has never been so lucidly treated before. The paper will be concluded in the May number.

EDWARD NEWELL

ERRATA.—Zool. p. 5358, line 17, for "Sebastopol", read "Simferopol"; present number, p. 5490, line 8, for "she-male" and "he male", read "she-male" and "he-male". The errata in Lieut. Blakiston's paper will appear with the next portion.

This day is published, 8vo., price 5s.,

**SIEBOLD on TRUE PARTHENOGENESIS in the HONEY
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'Proceedings of the Academy of Natural Sciences of Philadelphia,' Vol. viii. Nos. 1 and 2; 'A Notice of the Origin, Progress and Present Condition of the Academy of Natural Sciences of Philadelphia,' by W. S. W. Ruschenberger, M.D., Surgeon U.S. Navy; by the Academy of Natural Sciences of Philadelphia. 'Smithsonian Contributions to Knowledge,' Vol. viii.; by the Smithsonian Institution. 'Transactions of the Linnean Society of London,' Vol. xxii. Part 1; List of the Linnean Society of London, 1856; by the Society. 'Proceedings of the Literary and Philosophical Society of Liverpool, during the forty-fifth Session, 1855-56,' No. 10; by the Society. 'Remarks on the Habits and Distribution of Marine Crustacea on the Eastern Shores of Port Philip, Victoria, Australia, with Descriptions of Undescribed Species and Genera,' by John Robert Kinahan, M.B., T.C.D., M.R.I.S., Acting Professor Natural History Department of Science and Art, &c. &c.; by the Author. 'Revue et Magasin de Zoologie,' 1856, No. 9; by the Editor, M. F. E. Guérin-Ménéville. 'The Substitute,' Nos. 3, 4, 5 and 6; 'A Manual of British Butterflies and Moths,' No. 10; 'Elements of Entomology,' by W. S. Dallas, F.L.S., No. 3; by H. T. Stainton, Esq. 'List of the Specimens of Lepidopterous Insects in the Collection of the British Museum,' Part 9, Noctuidæ; by the Author, Francis Walker, F.L.S. 'The Zoologist' for December; by the Editor. 'The Journal of the Society of Arts' for November; by the Editor. 'The Literary Gazette' for November; by the Editor.

Election of a Subscriber.

J. V. Yatman, Esq., 2, Bombay Place, Amersham Park, New Cross, was balloted for and elected a Subscriber to the Society.

Mr. Westwood called attention to the excellent descriptions of New Holland and other exotic insects published by M. Perroud in the Transactions of the Lyons Society, and expressed a wish that some of our young entomologists would furnish similar papers, which really are a step in advance of Science: he was also desirous of knowing whether the recent discovery of the larva of *Agrotis Ashworthii* had contributed in any way to the settlement of the disputed question as to the genus to which this species should be referred.

Exhibitions.

Mr. Stevens exhibited a box of Lepidoptera and other insects, taken by Mr. Diggles at Moreton Bay, including *Papilio Anactus*, *M. Leay*; *Eurycus Cressida*, a fine *Bombyx*, allied to *Laria*, of which the female is apterous; *Deilephila Celerio*? and *Deiopeia pulchella*? apparently identical with the European species; and a fine Scuropterous insect, the *Stilbopteryx costalis* of Newman.

Mr. Douglas exhibited specimens of *Gelechia paupella*, bred from the flowers of *Linnaea dysenterica*: he observed that this species is closely allied to *G. inopella*, and when he discovered it he supposed it was the summer brood of that species; but, being larger, it would have been an exception to the general rule in Lepidopterous insects, in which the æstival specimens are usually smallest, as in the well-known instance of *Manomus illunaria*: he added that the species exhibited was probably the *Aphelosetia*? *paupella* of Curtis.

Mr. A. F. Sheppard sent for exhibition specimens of *Ypsipetes elutaria* and



a specimen of *Agrotis cursoria*, received from Mr. J. B. Hodgkinson, who considered they might prove to be distinct species.

Mr. Waterhouse observed that he had received from Liverpool a pill-box containing a quantity of *Aræocerus coffeæ* (*Phloëobius griseus*, Steph.), which had been very destructive to nutmegs: the species had been erroneously included in British lists: he added that he had received it from various parts of both the old and new world, India, Africa and South America.

Mr. Douglas said he had found this species in mace in the London Docks.

Mr. Westwood observed that the *Ptinus rubellus*, Marsh., was very destructive to various condiments.

Mr. Lubbock made some remarks on the reproduction of the *Daphnia*, observing that the females laid two sorts of eggs, one kind being fertile without impregnation: he knew similar cases occurred in Aphides, &c., and wished to hear from the Members present of any instances in Lepidoptera or other orders.

Mr. Westwood said *Lasiocampa Quercus* and *Orgyia antiqua* had been known to produce fertile eggs without male intercourse. Mr. Ingpen had found unimpregnated females of *Psyche fusca* produce fertile eggs, as recorded in Stephens' 'Illustrations.'

Mr. Douglas had known instances of the eggs laid by unimpregnated females of *Fumea nitidella* having hatched.

Mr. Stainton said that Mr. Robinson had had a brood of larvæ hatched from the eggs laid by a virgin female of *Arctia Caja*, but the larvæ did not live many days: in answer to a question, put by Mr. Waterhouse, as to the grounds on which this particular female was asserted to have been destitute of sexual intercourse, Mr. Robinson stated that the fact was most indisputable, as he only had one larva of the species, which was bred alone, and had produced the female in question.

Mr. Hudson said that two of his friends had observed *Liparis dispar* to produce fertile eggs without copulation.

Mr. Westwood stated that a most valuable paper had been published by Herr Lederer in the Vienna Transactions, four years ago, on the investigation of the larva of the *Geometræ*, he considered it would be a great addition to our knowledge of the British *Geometræ* to go through the list and note the characters by which Lederer's genera differed from those of Stephens, and publish the same in our own 'Proceedings' or 'Transactions.'

Mr. Douglas believed that M. Guenée's great work on the *Geometræ* was ready for publication, and might answer the purpose suggested by Mr. Westwood.

Mr. E. Sheppard observed that M. Lacordaire's fourth volume of the '*Genres des Coléoptères*' was nearly ready for publication, and that the plates of the first three volumes would be published with the fourth.

Mr. Armitage exhibited some Coleoptera, mostly from the Dardanelles and Mount Olympus, including a *Lethmo*, allied to, but apparently distinct from, cephalotes; a beautiful species of *Cardiophorus*; and a fine series of minute *Malachii*.

Mr. Westwood made some observations on the approximation of genera, and remarked that, on the separation of *Megacephala* from the *Cicindelidæ*, the latter became a group by itself.

Mr. Waterhouse denied that any real links existed in Creation between any two well-defined genera. In Mammalia a great many animals were pointed out as links between various groups; but when such animals, with their superficial resemblances,

came to be really examined, they were invariably thrust further away from each other: it was, he contended, the same through the whole of Creation.

Mr. Lubbock could not admit that such links never occurred, and mentioned the two large genera of Crustacea, *Calanus* and *Pontella*, as affording species which apparently militated against Mr. Waterhouse's views.

Mr. Wollaston observed that, a few years ago, *Carabus* and *Calosoma* were considered as well-defined genera, but of late the discovery of new species had so linked them that it now was impossible to separate them.

A conversation ensued on the variation of species, as apparently produced by climate and lapse of time, in the course of which Mr. Westwood observed that it would be interesting to know whether the animal remains found in mummies, &c., were the same species as at present exist in a living state.

M. Milne-Edwards said that the Ibis found embalmed with mummies was identical with the existing species.

Mr. Stainton read a paper intituled 'Observations on Genera.'—*E. S.*

Note on Serpula contortuplicata and on a Species of Othonia.—The inquiry in the last number of the 'Zoologist' (Zool. 5414) respecting the loss of the operculum in *Serpula contortuplicata* may be readily answered by many persons who have kept this elegant worm in confinement. It is by no means an uncommon occurrence for this species to lose the beautiful stopper with which, by an extraordinary development of apparently one of its tentacula, it is enabled to close its tube on the approach of danger. I have had one instance of this falling off in my own tank, and others have occurred in those of the Zoological Society, as well as in the large collection that Mr. Lloyd, of Portland Road, has generally by him; in some cases a perfect reproduction of the lost parts has taken place after a few weeks, and the animals have continued alive and healthy. I should imagine the cause of this shedding of the operculum to be the weak state of the worm, induced perhaps by an insufficient supply of its natural food, in which case the sudden withdrawal of the body might produce an unwonted strain on the stopper, and a separation would take place. As in most of the lower animals, there would be a tendency to restore the injured parts, and the time taken in perfecting them would probably depend on the strength of the creature. I find that the branchial plumes of the *Serpula* are broken and destroyed in the same manner, and apparently from a similar cause. Anything relating to the habits of a class so little generally understood as the Annelida being of interest, I am induced to mention a circumstance that I observed last week, and which to me was quite new, although perhaps known to others. A little worm of the genus *Othonia*, one of the Sabellidæ, was seen slowly crawling along the front glass of my tank; it gradually ascended to the surface of the water, and, after moving on the top to a distance of about four inches from the glass, began to sink very slowly, the body hanging perpendicularly, with the branchiæ upwards, the plumes being closely pressed together; the similarity of its appearance and manner to a caterpillar hanging by a thread induced me to try if the same means of support existed in the present case, and the passage of a small stick at about two inches above the worm, between it and the surface, at once settled

the question, as the connecting thread was so strong, although quite invisible, that with it I was enabled to draw the animal with some rapidity through the water, and, from its tenacious nature, the stick could only be disengaged by passing it round the edge of a rough bit of stone. I could find nothing on the surface of the water to which the thread might have been attached. Left to itself the worm started off tail foremost on another voyage of discovery, and was soon lost to sight among the crevices of the rock.—*E. W. H. Holdsworth*; 26, *Osnaburgh Street*, January 21, 1857.

Reason and Instinct. By the Rev. J. C. ATKINSON, M.A.

PART THE FIRST.

IN a former paper (Zool. 2341) I stated my impression (reasoning of course from our existing knowledge of, and observations on, the habits of animals), "that the thoroughly developed power"—of reasoning, namely, so far as developed in brutes—is confined "to those creatures which have come into contact with man:" and there is added "the question, How far, or to what degree, are they possessed of the power of reasoning? is one by no means easy satisfactorily to answer. It involves comparisons which require the nicest calculation and considerations of a highly complex character; and perhaps, after all, it might not be practicable to arrive at any very definite conclusion."

The question mooted above, or at least a modification of it, has been, for some time past, much in my thoughts, and in the present paper I propose to offer something towards an attempt at its discussion.

At the very outset of our inquiry a question of much interest presents itself; *viz.*, assuming that brutes do reason, in what mode do they reason? Are we to say that they reason in a mode analogous to that in which man reasons? or, is it identical with it? In other words, Is the *anima brutorum*, or the intellectual capacity in the brute creation, of the same essence with man's mind or intellectual powers, or merely resembling it in some parts of its action and manifestations? But, although this question presents itself here naturally and inevitably, we shall possibly be in a much better position for entertaining it when we have arrived at a somewhat more advanced stage of our inquiry.

I am quite aware that many will be ready to suggest a reference to the pages of Holy Writ, for, in some part at least, an answer to the inquiry we are engaged upon; and I do not, for a moment, seek to

question, much less ignore, the existence of certain passages in the Bible which at least seem to bear on our subject, and which therefore certainly (it may be alleged) challenge inquiry and demand consideration. Still, however willing to consent to this course, I desire at once to state my impression that no information or instruction of the kind anticipated will be found in the Bible.

The object with which the Bible was given was to teach men their relations with their Maker, and in such a way that nothing might be more plainly seen than that man's best interests coincided with entire and uncompromising observance of the Almighty's requirements. In order to this, it might be and was necessary that a brief introductory sketch of man's origin and that of the Creation at large should be given, but only so far that man, thoroughly understanding into what an abyss he had "by transgression" plunged himself, might the more willingly, as well as the more readily, comprehend the nature of the means of extrication which it was the business of the Bible, in all its several stages towards completion, to set forth and explain. Room for scientific disquisition or philosophical explanation there was none, in the scope of the volume itself, any more than in the mental culture or intellectual adaptability of those to whom it was progressively delivered, whether it were the Children of Israel under Moses, the Jewish nation in the time of the Prophets, or the "foolish things" and "weak things of the world" in the time of our Saviour and his Apostles. Consequently, when things which are properly the subject matters of scientific and philosophical inquiry and research are mentioned in the Scriptures, whether directly or in the way of allusion, they are spoken of in what we may term a popular manner, with no attempt at, or thought of scientific accuracy or even precision of expression: just as, in fact, we ourselves still speak of the sun as "setting," as "rising," as "journeying towards the west;" or of the dew "falling," or of the "thunder-bolt" striking the tree or the building. No doubt Moses was "learned in all the wisdom of the Egyptians," but to how many, or rather how few, of the Egyptians themselves was this learning common. And much more does this negation apply to Moses' countrymen, oppressed and ill-treated as we well know they were. His miracles might convince them that he was sent to them with a special mission by the great "I am," of whom doubtless they had retained a much more than merely traditional recollection; but not all his miracles could have convinced them that the world was a globe and not a plane surface with only enough inequalities to diversify what otherwise would have a dead level; that the earth was in motion and not the sun; that

there had been geological epochs, of almost inconceivable duration, countless ages before man was sent to be an inhabitant of the globe. All such topics as these—I believe we may use terms much more comprehensive, and say all topics whatever, if properly the subjects of scientific investigation—must have remained, even in the hands of an inspired lecturer, worse than unintelligible, even very “foolishness” to the Israelite of the Exodus, to the Jew of the Empire, or to the Gentile of the infancy of the Christian era; and if so, then, from the very nature of things, a stumbling-block as well; that is, an obstacle and hindrance to that which the Book professed to be and to have for its object. And therefore I expect to find, in the Bible, no information, properly so called, on geological matters, and none in Natural History, or Science, or Philosophy in whatever department. Allusions and references to such topics I may and do expect, but conveyed, notwithstanding, in words uncharacterized by precision or scientific accuracy.

The principal passages supposed to bear on our subject are, I think, the following:—

1. “Who knoweth the spirit of man that goeth upward, and the spirit of the beast that goeth downward to the earth?”—*Eccles.* iii. 21.

2. “Man that is in honour and understandeth not is like the beasts that perish.”—*Ps.* xlix. 20.

3. “Be ye not as the horse or as the mule, which have no understanding, whose mouth must be held in with bit and bridle, lest they come near unto thee.”—*Ps.* xxxii. 9.

4. “Natural brute beasts made to be taken and destroyed.”—2 *Pet.* ii. 12.

5. “Brute beasts” (“knowing things naturally”).—*Jude* 10.

1. With respect to this passage, it appears to me that the utmost we can say is that the writer gives utterance to the expression of a doubt, which is more apparent in the Septuagint, as follows, “And who has seen the spirit of sons of man, *if* it ascends up on high (εἰ ἀναβαίνει αὐτὸ ἄνω); and the spirit of the beast, *if* it descends down into (or upon) the earth? (εἰ καταβαίνει αὐτὸ κάτω εἰς γῆν).” One thing at least is clear, that he speaks of “the spirit of the beast” (τὸ πνεῦμα τοῦ κτήνους) as a thing having existence; and if we take his words strictly and literally, we shall be obliged to say that, as it is put in contradistinction to the *spirit* and not the *life* of man, it must mean something more than merely the life of the beast.

2. The second passage, to us, engaged in the inquiry we are urging, is less instructive still. In the Septuagint there is no word of "perish:" it is simply, "Man being in honour has no understanding; has been compared to the sense-wanting beasts" (τοις κτήνεσι τοις ἀνοήτοις, *i. e.* beasts that have no good sense or reason to govern and restrain their appetites and passions; ἀνόητος as opposed to σώφρων). For if we urge this epithet to its extreme sense,—take it quite literally,—it will prove a great deal too much, *viz.* that no brute, under any circumstances, possesses intelligence, or sense, or reason; which is contrary to fact.

3. This passage simply states that "horse and mule have no understanding" (οἷς οὐκ ἔστι σύνεσις), which, again, if we take it literally or precisely, establishes too much; as the intelligence, the docility of this or that brute are proverbs, and not only so, but are often adverted to in the Bible itself, as, for instance, "The ox knoweth his owner and the ass his master's crib; but Israel doth not know, my people doth not consider" (Isaiah i. 3); where, from the antithetical nature of the verse, the intelligence of the ox and ass are much more than merely inferred or hinted at. The passage now before us reminds man of his vast, his immeasurable superiority, in point of reason and understanding and good sense, by the proper use of which he may restrain and rule himself, over the brutes, and bids him act accordingly,—walk worthily of his superior gifts; but does not deny to the brutes the possession of that which, although it may be only such as not to render unnecessary restraints imposed by others, is still notoriously theirs.

4 and 5. Remarks of a precisely similar character may be made with respect to each of these two passages. If they prove anything in our inquiry they prove too much. If the brute creation,—for St. Jude's words reach to this extent,—be ἄλογον, in the full sense of the word, that is, devoid of reason or understanding, there is no exception to the rule: all beasts are equally understandingless, which is a conclusion simply absurd.

We come now to a passage of a different character: "For the earnest expectation of the creature waiteth for the manifestation of the sons of God. For the creature was made subject to vanity, not willingly, but by reason of him who hath subjected the same in hope, because the creature itself also shall be delivered from the bondage of corruption into the glorious liberty of the children of God. For we know that the whole creation groaneth and travaileth in pain together until now" (Rom. viii. 19—22). Indeed, this quotation seems to me

hardly relevant at all in our discussion, and I only refer to it because some, if not founding their notion on this passage, have at all events sought to confirm that notion by a reference to it,—the notion, I mean, that for the brute creation, as well as for the family of man, the present is not the only existence,—that there is a hereafter of life for the former as well as for the latter. If, however, there cannot be found more countenance for this notion in other arguments besides any which may be afforded by the text in question, it must, I think, remain without either support or foundation. For the whole rests upon the supposed sense of our translation, or rather, of one word in it,—“creature,”—which word does not bear, in the passage, any other sense the least differing from that borne by the expression “whole creation:” the word in the original being the same in each of the four verses quoted, viz. ἡ κτίσις.

On the whole, then, I am of opinion that a reference to the pages of Scripture does not, in the least degree, assist us in the conduct or solution of our inquiry, all that we find being either allusions to man's immense and unquestioned superiority over the beasts, with injunctions to him, thereon founded, to be careful not in any wise to lower himself toward the level of the beast by unworthy conduct; or else an admission of, or allusion to, the existence of a mystery past solving by human wisdom.

The safer and better and wiser method of conducting the inquiry would seem to be that of considering, as attentively and impartially as possible, the various actions of various species of animals, and then to endeavour, first, to refer such actions to what may reasonably appear to have been their source or influential cause, whether mere instinct or mingled instinct and reason, or what certainly can be no less than reason; and then, in the second place, if reason, to weigh and estimate what degree or kind of exercise of reason, from its simplest manifestation to its somewhat more complicated operation, may be supposed to be betokened by the several actions indicated.

The first part of this process has been already attempted, at least in a measure, in a former paper, and in the present paper we shall not formally retrace the steps then taken.

Now I do not mean to imply that it may prove to be easy, perhaps even possible, in a vast number of cases, to discriminate with absolute certainty between what clearly is instinct, and what, as clearly, is not instinct, as illustrated, I mean, by this or that set of actions possibly supposed to be prompted by it. In the instance of an infant how difficult it is, in its earliest period of life, to trace the difference which

exists in its actions so far as that difference depends on, or is due to, a difference in the source or origin of those actions. Everything done by an infant of a few days old is, no doubt, in its origin, due to an instinct; by instinct it sucks the mother's breast, the artificial nipple, the finger, anything that is presented in proximity to its mouth; and instinctively are all the other functions of its little life fulfilled. Perhaps the first symptom of nascent intelligence is the seeming recognition of the voice of the nurse; but even this is for weeks uncertain, and weeks more must elapse before it may be decisively pronounced that intelligence is fully operative,—that the child understands,—that some of its actions are certainly, though still possibly but in a small degree, under the influence of something decidedly higher than instinct: and this is true in the case of the existence which is under our hourly, our unceasing observation, and which is the object of our tenderest care and most unwearying interest and attention. How much more, then, must we look for corresponding difficulties and most fruitful sources of doubt, when we begin the attempt of assigning the actions of an animal, some of them to one source, some to another; to say of this that it is due to instinct,—of that, that it originates in something that operates otherwise than as instinct operates. No doubt many amid the actions of an animal may be brought, without much hesitation, under the former category; but of those remaining what will be the proportion presenting matter for inquiry, for examination, for much balancing, now on this side, now on the other? And all this, be it observed, is true in the case of those animals with which we are, so to speak, in the habit of intimate association,—the dog and the horse, for instance. We are deficient in means of communication with them, and they, to a much greater degree, with us. We must be close, skilful, accurate, patient, persevering observers, before we can convey new ideas, ideas out of the old, well-beaten track, to the most intelligent animal; and still more, before we can receive ideas they may desire to communicate to us. And if the difficulties be such where the facilities of observation and understanding are out of all measure the greatest, they must of necessity be greatly enhanced when we come to the examination and investigation of the actions of animals, or tribes of animals, little or not at all domesticated or brought under the influence of man. Such considerations are amply sufficient to show the existence of many hindrances in the way of our arriving at anything like an entirely satisfactory solution of the question before us. Still I hope we may find the materials for at the least approximating to such a solution.

I have already, in the preceding paragraph, to a slight degree, anticipated some of the conclusions I have come to in conducting this inquiry, and I may perhaps be permitted here, in some measure, further to anticipate a portion of the argument which, some might think, would have been quite as much in its place in a more advanced stage of the discussion. The author of 'Psychological Enquiries' says (p. 174), "We seldom see animals, in their free and natural state or otherwise than as being cowed and oppressed by the superiority of man;" and Mr. Conch ('Illustrations of Instinct,' p. 187) expresses himself thus: "I have purposely avoided drawing any illustrations of intellect from the history of the dog, because, however sagacious many of its actions are, an objection might be raised that its proceedings are influenced by the long-continued habit of receiving instructions from man." Now I cannot quite go with either of these gentlemen in this matter. I cannot think that a *man*, intellectually inferior to another man, can be properly said to be "cowed and oppressed by the superiority" of the other, even although daily or continually brought into contact with that other, and made to act in concert with or possibly in subjection to him. In fact, the reverse is proverbially true. And therefore I do not see how *animals* should at all suffer intellectually by their habits of association with and subjection to man, always, of course, supposing that they are not cowed or oppressed by something apart from intellectual superiority, such as hard usage, the unyielding fetters of stern discipline,—that, for instance, which elicits the popular air from the piping bulfinch, or produces the "paces" of the "managed horse," and the like. And, so far from thinking the long-continued habit of receiving instructions from man a prejudice to the animal, when made the subject of our special inquiry, or a hindrance and obstacle to ourselves in prosecuting the inquiry, I hold a contrary view. I should as soon think that, if it were my object to ascertain what is the intellectual or mental calibre of the Bushman or the Digger, the said Bushman or Digger would be prejudiced, as to the result of my inquiry, by a course of instruction in a good school, or that the inquiry itself would be, by that process, rendered more difficult, or less satisfactory and conclusive in the results it led to. For surely if it be made to appear not only that an animal, human or brute, has certain faculties, and that these faculties, under certain processes, are capable of being developed, strengthened, improved,—by this very fact the inquiry into the nature or the degree, or the measure of those faculties, antecedently presumed to exist, must be not so much facilitated as resolved, or at least put in the direct and

imminent way of resolution. Let me succeed in proving that the dog or the horse, which has been for three generations, or for ten, or for thirty, brought under the direct influence of the mental superiority of man, has been thereby benefitted in his own intellectual or apparently intellectual qualities, and I think a great step is taken in showing that the original dog or horse was possessed of the same attributes (for otherwise man must have implanted or created them), though we may say that, for all we know, they were originally latent or nearly so. And this argument becomes immensely more conclusive when applied in the case of an animal itself the first in the series of domestication, or the offspring of the first,—a seal, for instance, or an otter.

But to grapple more closely and methodically with our subject:—

I. The metaphysical distinction between what is animal and what is not is stated by Locke as follows:—"The faculty of perception (which he defines as being the first step and degree towards knowledge, and the inlet of all the materials of it) seems to be that which puts the distinction betwixt the animal kingdom and the inferior parts of Nature:" and his arguments in support of the statement are not easily to be answered.

II. "The next faculty of the mind," he continues, "whereby it makes a further progress towards knowledge is that which I call retention, or the keeping of those simple ideas, which, from sensation or reflection, it hath received. And this it does in two ways; first, by means of contemplation; second, by means of memory;" which latter term he takes to signify "that the mind has a power, in many cases, to revive perceptions which it has once had, with this additional perception annexed to them, that it has had them before. This faculty of laying up and retaining the ideas that are brought into the mind several other animals seem to have to a great degree as well as man."

III. "Another faculty we may take notice of in our minds is that of discerning and distinguishing between the several ideas it has. * * How far brutes partake in this faculty is not easy to determine. I imagine they have it not in any great degree. For though they probably have several ideas distinct enough, yet it seems to me to be the prerogative of human understanding, when it has sufficiently distinguished any ideas so as to perceive them to be perfectly different, and so, consequently, two, to cast about and consider in what circumstances they are capable to be compared. And, therefore, I think beasts compare not their ideas further than some sensible circumstances annexed to the objects themselves. The other power of

comparing which may be observed in men, belonging to general ideas, and useful only to abstract reasonings, we may probably conjecture beasts have not."

IV. "The next operation we may observe in the mind about its ideas is composition, whereby it puts together several of those simple ones it has received from sensation and reflection, and combines them into complex ones. * * In this also I suppose brutes come far short of man. For though they take in and retain together several combinations of simple ideas—as possibly the shape, smell and voice of his master make up the complex idea a dog has of him, or rather are so many distinct marks whereby he knows him—yet I do not think they do of themselves ever compound them and make complex ideas."

V. The fifth power or faculty of the mind "is called abstraction, whereby ideas taken from particular beings become general representatives of all of the same kind; and their names general names applicable to whatever exists conformable to such abstract ideas. * * If it may be doubted whether beasts compound and enlarge their ideas that way, to any degree: this I think I may be positive in, that the power of abstracting is not at all in them, and that the having of general ideas is that which puts a perfect distinction betwixt man and brutes, and is an excellency which the faculties of brutes do by no means attain to. For it is evident we observe no footsteps in them of making use of general signs for universal ideas: from which we have reason to imagine that they have not the faculty of abstracting or making general ideas, since they have no use of words or other general signs. * * And I think we may suppose that it is in this that the species of brutes are discriminated from man; and 'tis that proper difference wherein they are wholly separated, and which at last widens to so vast a distance. For if they have any ideas at all, and are not bare machines (as some would have them) we cannot deny them to have some reason. It seems as evident to me that they do, some of them, in certain instances, reason, as that they have sense: but it is only in particular ideas, just as they received them from their senses. They are, the best of them, tied up within those narrow bounds, and have not (as I think) the faculty to enlarge them by any kind of abstraction."

I have thought it best to quote the remarks of the great original thinker thus *in extenso*, but, instead of making a running commentary on them in due sequence, I purpose to examine and possibly demur to the correctness of what has been said under the last head. Because, if it can be shown that brutes, or some of them, do actually possess

more of this power of abstraction than he seems willing to concede to them, the difficulty, if any exists, of establishing a claim, on their part, to the possession of powers of composition and comparison greater than those laid down and defined in the preceding extracts will be greatly lessened.

To proceed, then: and, in the outset, for the object of the simplification afforded of a somewhat hard word, quite as much as for anything else, I extract a few sentences more from a volume already quoted (Brodie, p. 168): "Now, taking it for granted that Abstraction can mean nothing more than the power of comparing our conceptions with reference to certain points to the exclusion of others; as, for instance, when we consider colour without reference to figure, or figure without reference to colour; then I do not see how we can deny the existence of this faculty in other animals, any more than in man himself."

I will next take two or three recorded instances of sagacity or intelligence on the part of the dog or some other animal, and, with their assistance, try the question of abstraction or no abstraction.

"The sagacity of the animal, as shown in the following incident, will be better understood if we consider that it is probable this dog had never before seen an instance of similar danger from fire, and had never before contemplated fire in any other form than as an useful contrivance for his own and his master's comfort. In the spring of the year 1845, a mastiff dog, in Cornwall, having discovered that the roof of his master's house was in flames, ran in doors howling dismally, and, pulling at the garments of the inmates, urged their retreat from the building; and, hurrying out of the house, howled again and directed their attention by his looks to the flaming roof." (*Illustrations of Instinct*, p. 189). Again; a friend of Mr. Jesse's "had been reading a newspaper in bed, with a candle near him, and had fallen asleep. A favourite terrier always slept in the room with him, and he was awoke by the dog scratching him violently with his fore feet. Thus his life was probably saved, for he was in time to call for assistance, and prevent the house being burnt." (Jesse's *'Gleanings,'* i. 236). These two instances, and I have a variety of others at command, sufficiently establish the possession, by certain brutes, of the faculty or power of abstraction. If it were not by the idea of danger that the actions of these two dogs were motived, by what were they? Not simply by the unusualness of the appearances they observed, for dogs do not act thus if they see a much fiercer conflagration than was to be beheld in the flaming roof or blazing newspaper and bed-linen. Indeed, no commonly

plausible explanation of the conduct of these two brutes can be given, except that involved in the concession of the idea—the abstract idea—of danger, and of danger, moreover, threatening their master or their master's family.

I will select another instance or two. "Two small terriers were in the habit of leaving their home together and hunting rabbits in a warren at some distance from it. One of them got so far into a rabbit-burrow that he could not extricate himself. His companion returned to the house, and by whining and using many significant gestures, attracted the notice of his master. When he had done this he ran a short way forward and then returned; and, after repeating this some time, his master was induced to follow him. The dog led him to the rabbit-burrow, and he began to bark and scratch violently; and, on procuring a spade, the dog was dug out." ('Gleanings,' i. 230). Again; amid the gloom of a dark night a dog is observed incessantly barking before the leaders of a mail-coach travelling at its usual rapid pace, and jumping up at the horse's heads. Fearful of an accident the coachman pulls up, and the guard gets down to drive the animal away. "The dog, however, ran a little way before the guard and then returned to him, making use of such peculiar gestures that he was induced to take out one of the lamps and follow the dog. About a hundred yards on he found a farmer lying drunk across the road, and his horse grazing by the side of it." ('Gleanings,' i. 235).

How are the actions of these two dogs to be accounted for? To me it appears most evident that there was in the mind of each of them an influential idea at work, and that that idea was there through a process of abstraction. It was with the view of obtaining help or assistance that they acted as they did; and the abstract idea of aid—in the one case needed by the companion dog, in the other by the actor's master—was the influencing motive to the several actions recorded. Indeed, in the second case, there was something more: there was a combination or "compounding" of ideas and motives. Had the coach gone on the master would have been grievously injured, possibly killed. The dog's attempt—I think we may fairly say his thought and wish—was therefore to stop the coach; the attempt and wish to stop the coach originating, of course, in his perception of his master's danger, and his desire to avert it. But when the coach was stopped, he wished and aimed at something more, and that was help; and, therefore, he ran before the guard in the way noted, and otherwise conducted himself so as to induce the guard to follow him to the place where his helpless master lay, and—what his own force

was inadequate to—rescue that master from the imminent danger. At least it is thus we should have reasoned had it been a dumb human being who had acted as these dogs are declared to have done, and we should, moreover, have given him credit for the thoughtfulness and energy he displayed, in spite of the great natural disadvantages he lay under, for giving alarm or soliciting assistance in the alleged case of need. Will it not then be uncandid and unfair if we reason and deal on other grounds with the dumb brute?

Once more: a terrier acquires "a habit of hunting for hares by himself. He soon found that he was labouring in vain, for, with all his hard running, he never could catch one. His master often watched his endeavours to coax an excellent greyhound out of the yard. He at last effected his purpose. The good nose of the terrier soon enabled him to find a hare, which the greyhound killed and brought home. After that the two dogs became the most arrant poachers in the country, and were inseparable till the halter ended their poaching, their friendship and their lives." (*Gleanings*, i. 25.) A somewhat similar case occurs to my recollection, except that a setter and a greyhound were the parties implicated. To prevent the setter from hunting on his own account, a heavy clog was fastened to his neck. The difficulty, however, hence arising, was surmounted by the greyhound carrying the clog in his mouth until the setter found the game; he then dropped it and began the course. Again; "A raven frequently went hunting with a dog that had been bred up with him. On their arrival at a covert the dog entered and drove the hares and rabbits from the thicket, while the raven, posted on the outside of the cover, seized everything that came in his way, when the dog immediately hastened to his assistance, and by their joint efforts nothing escaped."

In each of these three cases—the first being particularly interesting from the often-observed process of "coaxing" or invitation—the abstract idea of help, mutual help, was present to the mind of either of the actors; and, moreover, in the first instance, originating in the mind of one, was by him intelligibly and successfully communicated to that of the other.

I pause here to advert to a suggestion which forcibly presents itself to our regard. The animals whose "doings" we have been noticing might not also be able to commend their "sayings" to our attention,—might have no "use of words,"—but can we, in strict truth and fairness, pronounce them to have been also without any other "general signs," by the use of which they could succeed in

conveying or imparting their ideas? In the case of the fire the dogs succeed in making their meaning evident,—in signifying their ideas,—in conveying the intelligence they wished to impart. Was it not the same with the dog whose canine companion had got himself into such an unpleasant “fix” in the rabbit-burrow?—with him whose master lay, drunk and senseless, in the very track of the rapidly-advancing coach?—with the terrier who coaxed the mentally “slower” but physically faster greyhound into the pleasures of a stolen course?

And this brings me to a part of our reasonings which requires somewhat more detailed notice and elaboration, and which I desire to preface by the simple statement that the entirely and ascertained successful communication of ideas, very various in their nature and origin, by various animals, in a state of domestication, to their fellows, or to animals of a different tribe from themselves, is a fact which rests upon a great number of authentic observations. But, without dwelling upon this at present, I wish to state my firm belief that animals in general have means of intercommunication, that they are able to communicate their ideas to one another, and that some at least of those means and that ability consist in uttered sounds. I do not simply mean that the note or action of alarm of one species of bird or beast is intelligible, to the individuals of various species of both those families who may be within scope of hearing or observation, as well as to its own more-immediate fellows; but that, besides this, animals of the same species, or of different species, but adopting similar habits and places of resort, communicate successfully and instantaneously to their companions other ideas beside those of apprehension or alarm. How often have I seen a covey of fifteen or eighteen partridges rise as one bird;* a flock eighty or a hundred golden plover take wing at the same instant, fly—every bird of them—in the same direction, turn at the same instant, rise to a considerable height all together, wheel round their disturber again and again with one consent, lower their flight as instantaneously, and finally all settle on the spot they seem, by their manner, to choose, or to adopt as chosen by some leader, without one doubtful or dissentient bird among them. Not long since I observed all these particulars in the flight of a large flock of golden plover. Among them I detected one gray plover. He was as much

* Ten days since I marked a covey on the edge of a steep bank of no great height: I came upon them quietly, and saw one bird feeding above the rest, who were out of sight on the bank below, for some seconds before it saw me. After a pause I advanced a step; it raised its head, saw me, and in an instant was on the wing, but not perceptibly before the rest, most of whom certainly did not see me at all before taking wing.

at home with them in all their evolutions as if golden and not gray. How often, too, on the oozes of the Essex coast may tens of thousands of the there-called ox-bird be seen in a flock, and with them redshanks, a few gray plover, ring dotterel, &c. The whole spring together, fly together, wheel together, presenting to the spectator this moment a sheet of brilliant white, and the next, as they execute one of their marvellous turns, nothing but a dusky cloud of rapidly moving dark objects. All this would be not simply unintelligible, but impossible, except on the supposition that they have some feathered fogleman to give the word and the time, and that their code of signals, however expressed, is not only intelligible but thoroughly understood and implicitly acted on by every bird in the flock.

But again; a flock of wild geese alight to feed in a given field; one of the number invariably undertakes the post of sentinel, the others straightway fall to on the corn or pease. How is he appointed,* if they have no means of communication, no language, and no substitute for language? The same of rooks, of deer feeding, indeed of all gregarious tribes of birds and beasts.

I adduce another instance: in my garden here I grow a good many strawberries, and, from my vicinity to the moors, I am liable to the visits and depredations of a number of ring ouzels, in addition to the customary detachments of blackbirds and thrushes. At first, one bird, or perhaps a pair, appears. If I shoot these first visitors, after a day or two another arrives; and if he, too, is shot, a third and a fourth come straggling in at intervals of a day or so. But suppose I permit the first comers to feast unmolested, in three days I have twenty-five or thirty of the boldest, most persevering, and—as far as ring ouzels prevail amid the numbers—most insolent robbers, always engaged in plundering my strawberry-beds, nor can I succeed in expelling them, save for a short time after the gun has been discharged, as long as I have any fruit which is palatable to them left in the garden. But, further, Bishop Stanley gives the following anecdote, and vouches for its truth:—"At a gentleman's house in Staffordshire the pheasants are fed out of one of those boxes, the lid of which rises with the pressure of the pheasant standing on the rail in front of the box. A waterhen observing this, went and stood upon the rail as soon as the pheasant quitted it; but the weight of the bird being insufficient to raise the lid of the box, so as to enable it to get at the corn, the waterhen kept

* "By what language, or by what instinct, is this bird made to watch for the safety of others, when he was probably as hungry as those which were feeding near him?"—"Gleanings," ii. 206.

jumping on the rail to give additional impetus to its weight; this partially succeeded, but not to the satisfaction of the sagacious bird. Accordingly it went off, and soon returning with another bird of its own species, the united weight of the two had the desired effect, and the successful pair enjoyed the benefit of their ingenuity." (*Familiar Hist. of Birds,* 309.) How are such facts as these to be accounted for, if not on the ground that, in the one case, blackbirds and their congeners can communicate with each other; in the other, that water-hens can, and with some explanatory matter added to the bare communication, moreover?

I might multiply such instances as those just given indefinitely. I might appeal to the experience of every moderately attentive observer to confirm and add to the number so multiplied. I might produce thousands of recorded facts which must remain inexplicable on any other hypothesis than that animals have some kind of language or substitute for language, immeasurably inferior, of necessity, to that vitalised by articulate speech, but still sufficient, and well adapted to the requirements of those whose lot it is to use it and depend upon its use. But I turn to a different line of argument: how many thousand species of birds and beasts are there in creation, and no one of them dumb, voiceless, unable to utter sounds; and the majority of all these countless creatures are able to utter a variety of sounds. The partridge has five distinct, and, even to the comparatively dull ear of man, quite intelligible notes. The nuthatch has three besides what it may employ with its young. The golden plover four; the blackbird three, besides its song, and all with the same reservation as in the case of the nuthatch. But, as to this reservation, who shall venture to limit, as to number, the modes of expression in use between the mother and her brood of young ones? One short, by no means very loud sound brings them all clustering round her; another sends them scudding in all directions for concealment; a third seems to have stricken them all with instant paralysis, so suddenly do they cower motionless on the spot each occupied the moment before the parent bird spoke to them. Surely it is derogating foolishly and presumptuously from Infinite Wisdom to question or deny, with such facts before us, that animals of various kinds are capable of vocal communications with each other; for it leaves us no alternative but to say, and in despite of the simplest exercise of common candour, that the power to produce these different notes, these various vocal inflections, these diverse intonations and expressions, were given without purpose and with no effect or result.

All this, too, independently of another consideration. The hapless individual of our own, by comparison, exalted species, who has no power of speech and none of hearing, employs signs and symbols to express his ideas, to be the medium of communication not only between himself and his hearing or speaking fellows, but between himself and others, like himself, deaf and dumb. The bird and the beast are no whit behind him in the possession and in the use of the same power and medium. Hear the remarks of a close and most intelligent observer:—"If, when wild geese are feeding, any enemy or the slightest cause of suspicion appears, the sentry utters a low croak, when the whole flock immediately run up to her, and, after a short consultation, fly off. * * Thus also wild ducks, curlews, crows, and almost all birds, when feeding in flocks, leave sentries on whose vigilance the rest entirely depend, taking no heed of anything around them, but feeding in conscious safety. Nor is it necessary for a cry of alarm to be given, as the flock perfectly understand what is going on by the actions or looks of the one who is watching, distinguishing at once whether the sentry is intent on some sound or object at a distance, or whether the danger is imminent and pressing. It is not only by the voice and action of birds of *their own* kind that flocks of wild fowl guide their actions; the startled movement or cry of a red-shank or peewit is sufficient to put on wing a whole flock of geese or ducks instantaneously, and also to tell exactly from what point the danger is to be apprehended." ('Tour in Sutherland,' ii. 140.)

On the whole, and giving careful and impartial consideration to the infinite number and variety of facts which bear on this subject, it appears to me impossible to come to any other conclusion, except that animals do possess adequate means of communication with each other; and that many of these means of communication are sufficient to convey precise ideas not only to the fellow-animals of the same species, but to a variety of others of different species, different genera, and even different tribes. It may be quite true that these communications are limited—*so far as we know*—to a small number of subjects,—their food, the approach of danger, the means of escape, the place of refuge, and the like; but, suppose this admitted, I contend that the reasons for such admission are, at the least, fewer, less apparent, and much less cogent and convincing than those for admitting the power of communication contended for, whether we call that power language, or by any other name, or leave it without any specific name whatever.

I now revert, very briefly, to a part of this branch of our subject barely glanced at a few pages back,—I mean the power possessed by

animals subject to the influences of domestication, to impart information or communicate ideas, in a much more extensive sense than we have contended for in the case of animals still in a state of nature, to other domesticated animals, whether of a different tribe or not, which of course includes the converse power of apprehending or rightly conceiving of what is so communicated. Dog communicates with dog, dog with raven and raven with dog, dog with horse, dog with goose, and so on; while, besides all this, they all communicate intelligibly with man, and intelligently receive his communications, whether made by word or sign. Horses employed in farm draught-work are guided and influenced almost entirely by the voice and tones of their driver, to the comparative exclusion of whip and reins; and it is quite worthy of notice that a farm-horse taken from one district of the kingdom to another, where different words or sounds are used by the ploughman or carter in addressing, encouraging, chiding his team, is as much at a loss and as awkward as would be the English labourer under a French foreman or a French recruit with no explanation of the orders of the English drill-sergeant. Still the equine foreigner is not long in picking up the meaning of the new words addressed to him, and soon becomes as habile as the native of his new district. Other instances of the same kind might be given. The following examples of intelligence, too, are very striking:—"The dog that lives with his master constantly, sleeping before his fire, instead of in the kennel, and hearing and seeing all that passes, learns, if at all quick witted, to understand not only the meaning of what he sees going on, but also, frequently in the most wonderful manner, all that is talked of. I have a favourite retriever, a black water-spaniel, who for many years has lived in the house and been constantly with me. He understands and notices everything that is said, if it at all relates to himself or to the sporting plans for the day. If at breakfast time I say, without addressing the dog himself, 'Rover must stop at home to day, I cannot take him out,' he never attempts to follow me; if, on the contrary, I say, however quietly, 'I shall take Rover with me to day,' the moment that breakfast is over he is all on the *qui vive*, following me wherever I go, evidently aware that he is to be allowed to accompany me. * * His great delight is going with me when I hunt the woods for roe and deer. I had some covers about five miles from the house, where we were accustomed to look for roe. We frequently made our plans over-night, while the dog was in the room. One day, for some reason, I did not take him; in consequence of this, invariably when he heard us at night forming our plan to beat the woods, Rover started alone

very early in the morning, and met us up there. He always went to the cottage where we assembled, and sitting on a hillock in front of it, which commanded a view of the road by which we came, waited for us; when he saw us coming, he met us with a peculiar kind of grin on his face, expressing, as well as words could, his half-doubt of being well received, in consequence of his having come without permission: the moment he saw I was not angry with him, he threw off all his affectation of shyness, and barked and jumped upon me with the most grateful delight." (*Highland Sports*, p. 108.) Again; "A shepherd once, to prove the quickness of his dog, who was lying before the fire in the house where we were talking, said to me, in the middle of a sentence concerning something else, 'I'm thinking, sir, the cow is in the potatoes.' Though he purposely laid no stress on these words, and said them in a quiet, unconcerned tone of voice, the dog, who appeared to be asleep, immediately jumped up, and leaping through the open window, scrambled up the turf roof of the house, from which he could see the potato-field. He then, not seeing the cow there, ran and looked into the byre, where she was, and, finding that all was right, came back to the house. After a short time, the shepherd said the same words again, and the dog repeated his look-out. But, on the false alarm being a third time given, the dog got up, and wagging his tail, looked his master in the face with so comical an expression of interrogation, that we could not help laughing aloud at him; on which, with a slight growl, he laid himself down in his warm corner, with an offended air, and as if determined not to be made a fool of again." (*Highland Sports*, p. 111.) If need were, I could parallel these instances by others precisely analogous, from the biographies of different animals who were intimate acquaintances of my own; my old friend Pepper (*Zool.* 2337) being one of them; a very excellent water-spaniel retriever bitch, belonging to one of my oldest friends and allies with whom I used to spend much time, another; a third, my own property, and so on. But I should only be occupying space and time unnecessarily by so doing.

Now, when we fairly and impartially consider the numerous and unquestionable instances and modes of intercommunication and mutual intelligence possessed by animals, not only, and in a very remarkable degree, among domesticated species, but also by those which are living in their natural wild condition, I am not prepared to assent to the following dogma:—"Men, who through some defect in the organs, want words, yet fail not to express their universal ideas by signs, which serve them instead of general words; a faculty which we

see beasts come short in" (Locke, ch. xi. § 11); unless, that is, we are permitted to take the phrase "come short in" as meaning only "are much inferior" (to man, namely), instead of, as the author most certainly intends, "have no use of," or "are entirely without."

If, then, it be conceded—as I think it will be by any candid and unprejudiced thinker—that, to a certain extent, and under certain limitations, a variety of animals do possess adequate and intelligible means of intercommunication, not only is one chief ground for denying to these brutes the power of "Abstraction, or making general ideas" cut away, but a most conclusive argument for the actual possession by them of that faculty mainly established; and that, altogether independently of the manifold and most striking evidences of the existence and activity of the faculty, as illustrated in countless actions of great numbers of various brutes.

To proceed, then: to whatever extent we may have succeeded in adducing satisfactory reasons for believing animals, or some of them, to be possessed of the power or faculty of abstracting,—to be even capable of carrying on a train, no matter how short, of abstract reasoning; we have, to the same extent, made it unnecessary to go, step by step, through the process of showing them to be endowed, in no inconsiderable degree, with the faculty of comparing and compounding their ideas; for most certainly, here, the less is included of the greater: and, to say the least, it may be quite as interesting instead to adduce a few additional facts in illustration of the workings of brute intellect. "Though dogs often disagree and are jealous of each other at home, they generally make common cause against a stranger. Two of my dogs, who were such enemies and fought so constantly, that I could not keep them in the same kennel, seemed to have compared notes, and to have found out that they had both of them been bullied by a large powerful watch-dog, belonging to a farmer in the neighbourhood. They suspended their own hostilities and formed an alliance, and then they together assaulted the common enemy, and so well assisted each other, that, although he was far stronger than both my dogs put together, he was so fairly beaten and bullied that he never again annoyed them or me by rushing out upon them as we passed by the place, as he had always been in the habit of doing before he received his drubbing." (Tour in Suth. ii. 213.) "I went one morning in July, before daybreak, to endeavour to shoot a stag.* * Just after daylight I saw a large fox come very quietly along the edge of the plantation in which I was concealed: he looked with great care over the turf wall into the field, and seemed to long

very much to get hold of some hares that were feeding in it, but apparently knew that he had no chance of catching one by dint of running; after considering a short time, he seemed to have formed his plans, and, having examined the different gaps in the wall by which the hares might be supposed to go in and out, he fixed on the one which seemed the most frequented, and laid himself down close to it, in an attitude like a cat watching a mouse-hole. * * I watched all his plans; he first, with great silence and care, scraped a small hollow in the ground, throwing up the sand as a kind of screen between his hiding-place and the hares' meuse; every now and then, however, he stopped to listen, and sometimes to take a most cautious peep into the field; when he had done this, he laid himself down in a convenient posture for springing upon his prey, and remained perfectly motionless, with the exception of an occasional reconnoitre of the feeding hares. When the sun began to rise, they came one by one from the field to the cover of the plantation; three had already come in without passing by his ambush, one of them came within twenty yards of him, but he made no movement beyond crouching still more flatly to the ground—presently two came directly towards him; though he did not venture to look up, I saw, by an involuntary motion of his ears, that those quick organs had already warned him of their approach; the two hares came through the gap together, and the fox, springing with the quickness of lightning, caught one and killed her immediately. * * After seeing this I never wondered again as to how a fox could make prey of animals much quicker than himself, and apparently quite as cunning." (*Highland Sports*, p. 164.) "A fox had been partially tamed, and was kept fastened by a chain to a post in a courtyard, where he was chiefly fed with boiled potatoes. But the animal seems to have thought that a desirable addition might be made to his fare from the numerous fowls that strutted round him, but whose caution kept them beyond the reach of so formidable an enemy. His measures were soon taken; and having bruised and scattered the boiled potatoes which he had received for his dinner at the extremity of the space that the length of his chain enabled him to command, he retired in an opposite direction, to the full extent of his chain, and assumed the appearance of utter regardlessness of all that was passing around him. The stratagem succeeded; and when some of the fowls had been thrown so much off their guard as to intrude within the circle of danger, the fox sprung from his lurking-place, and seized his prey." (*Illust. of Instinct*, p. 176.) The following I have from an old and much-valued friend, a good and scientific naturalist and excellent

man, resident at Scarborough. Walking with a favourite Newfoundland dog of large size, one frosty day, he observed the animal's repeated disappointment on putting his head down in the attempt to drink at sundry ice-covered pools. After one of these disappointments my friend broke the ice with his foot for his thirsty companion. The next time the animal was prompted by his thirst to try and drink again, instead of waiting for his master to break the ice as before, he set his own huge paw forcibly on the ice, and obtained water for himself. I will give but one more anecdote. An elephant, receiving company, has some eatables given him: one article—if I remember right, an apple or an orange—is dropped, and rolls just out of reach of the creature's trunk, but so that it lies only a short distance from a wall. The elephant, finding himself unable to reach the fruit by the ordinary process, by the forcible expulsion of the air from his trunk drives it so strongly against the wall that it rebounds far enough to be easily within his reach.

To these instances of intelligence,—and I may say, with respect to more than one of them, of sustained reasoning,—I might add a vast number of others, the result of observations on the habits and actions of the elephant, the horse, the cat, the otter, the pig, the seal, the kangaroo, the stoat, the weasel, the fox, the parrot, the magpie, the nuthatch, the ringdove, the flycatcher, &c., &c., many of them to the full as striking and conclusive as the generality of those quoted; but I cannot think it necessary. And with such an array as has been produced, there must be a strange degree of prejudice, or an equally strange unwillingness to admit a fully-warranted conclusion, if we seek to deny the possession by brutes of intellectual faculties capable of the processes of composition and abstraction. Have we never heard the parent or the nurse telling of the quickness, the intelligence, the cleverness of the little child, and, in support of her eloquence, adducing actions done or remarks spoken by her pet that did not evince so much intelligence and reasoning power by one half as some of the "dumb brutes" in the instances recorded above, displayed in the conduct attributed to them? I do not know that I can better close this portion of our subject than by the following passage from Mr. Jesse's '*Angler's Rambles*':—"Although no animal is endowed with mental powers equal to those which the human race possesses, yet there is not a faculty of the human mind of which some evident proofs of its existence may not be found in particular animals. Thus we find them possessed with memory, imagination, the powers of imitation, curiosity, cunning, gratitude, ingenuity, devotion or affection

for their superiors, and other qualities. They are architects, and they dig, wage war, and extract various substances from plants and from the earth and water. They are able to communicate their wants, their pleasures and their pains, their apprehensions of danger and their prospects of future good, by modulating their voices accordingly. Each individual of every species has its own particular language, which is perfectly understood by the rest. They ask and give assistance to each other. They make their necessities known, and this branch of their language is more or less extended, in proportion to the number of their wants. Gestures and inarticulate sounds are the signs of their thoughts."*

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Zoology: its present Phasis and future Prospects. By R. KNOX, M.D., F.R.S.E., Lecturer on Anatomy, and Corresponding Member of the Académie Impériale de Medicine of France.

Section I.

THE section of Natural History which treats of animals, their nature, habits, and uses to man, when they happen to be of use to him, which is but seldom, is now fairly embarked in a new career. Like other arts and sciences, it has become industrial: this is the phrase, I believe—industrial. The greatest, the most accurate of all the observers of antiquity, the man who combined within the compass of his vast intellect a much greater amount of science, literature and art than any mortal since his time—Aristotle—

* I cannot refrain from subjoining the following striking passage, which I take from 'Psychological Enquiries':—"It is observed by a modern writer 'that there is hardly a mechanical pursuit in which insects do not excel. They are excellent weavers, house-builders, architects. They make diving-bells, bore galleries, raise vaults, construct bridges. They line their houses with tapestry, clean them, ventilate them, and close them with admirably fitted swing-doors. They build and store warehouses, construct traps in the greatest variety, hunt skilfully, rob and plunder. They poison, strangle and sabre their enemies. They have social laws, a common language, division of labour and gradations of rank. They maintain armies, go to war, send out scouts, appoint sentinels, carry off prisoners, keep slaves and tend domestic animals. In short, they are a miniature copy of man rather than that of the inferior Vertebrata."

did not deem it beneath his dignity to compose a history of animals. In what odour Zoology, properly so called, stood with his countrymen, we do not, for certain, know ; but of this we are sure, that during the entire period of Roman dominancy Zoology was of no repute. Yet even then, when, instead of Zoological Gardens and Museums of Natural History, gladiatorial exhibitions, in which brute man opposed to brute beast on their way to the charnel-house, formed the delight of a Nature-despising population, there were to be found a few simple-minded men, who thought it worth while to note what Nature, in some of her unintelligible freaks, had placed on earth in an animal form, in addition to man, oxen, horses, pigs and sheep,—these being clearly all or nearly all that are really useful in animal life to him. Persons there were even then, no doubt, curiously observant of what mankind in the mass very naturally and very properly despises. Such were to be found, also, at work—and this, considering the form of humanity which then prevailed, seems almost incredible—during the middle or dark ages, the most terrible period, seemingly, of human existence, when *feudalité* and *hérédité* had done their best and their worst to debase human nature, by depriving man of all his natural rights,—*feudalité* and *hérédité*, those terrible instruments of evil, those implacable scourges of humanity, and of which we have still, unhappily, a large sprinkling even in England, raged at this period over Europe, extinguishing the rights of man and his claims to be treated as a human being. Yet even then a few naturalists were to be found, even in practical England, where they were naturally and have ever been held in the highest contempt. At last two men appeared whose genius rescued this humblest of the sciences of observation from its degraded and debased condition, restoring it to that position amongst the Sciences in which Aristotle first placed it. These great men were Carl Linné and the Count de Buffon. But this was all they effected; and Natural History (we allude more especially to Zoology) was fast lapsing into its pristine, anecdotic, puerile, harmless condition, when a genius appeared, destined to revolutionize not merely Zoology, but the human mind itself. That man was George Cuvier, an anatomist. He it was who formed an era not merely in Zoology, but in human history. From that moment Zoology, removed from the school-book and from the pleasant story-telling gossips about “my first tiger” and “my last serpent,” became a fitting study, and a difficult one, too, for the deepest thinkers of the day. Whilst Cuvier lived the phasis of Zoology was wholly and thoroughly scientific ; his vast reputation and unbounded influence prevented all inroads upon it ; the wit of the

bar was silent in his presence; the church looked on but said nothing, biding, as usual, "its time;" smaller wits saw the propriety of exercising their pens on more assailable topics; Voltaire himself, had he been alive, must have yielded his assent to the truth of Cuvier's demonstration. But, now that Cuvier and the last of the anatomical school of France, DeBlainville, are dead, symptoms of a *renaissance* appear, claiming for certain great men, long forgotten, becoming niches in the Temple of Fame. The chief of these forgotten illustrious is Buffon. Out of the combined labours of the Linnean and Cuvierian eras it is proposed to form a phase distinct from yet not at variance with the hypotheses and views of the illustrious Frenchman. Hopeless as to forming an era, the modern zoologist would yet fain retain his favourite study amongst the living sciences; he beseeches you not to send it back to the anecdotic and amusing literature of the past.* The history of the dead and extinct zoological world, wonderful though it be, he perceives to be scarcely sufficient to enable it to stand its ground, the living and actually existing world being that alone which interests men. Little avails it to the present generation to be told what kinds of bears and hippopotami, saurians and other reptiles, if they were reptiles, inhabited a land, to call which ancient Britain must unquestionably be erroneous in every sense of the term. An attempt, accordingly, is being made to connect Zoology with the useful and industrial arts,—to hand it over to Boards of Trade; and as this plan succeeds in England with everything, sacred and profane, a temporary success may be anticipated, and the industrial era of Zoology may flourish even in France for a time. For the honour of Science may that period be brief! In the meantime we may ask and endeavour to solve the question, What is its present phasis in a scientific point of view; what its future prospects?

Ontology, or the science of beings; Comparative Physiology; Zoology, in its most extended signification, embracing the existing and the extinct, the living and the dead organic worlds—mean nearly the same thing. The Philosophy of Zoology, a new theory of Zoology, means merely a new "interpretation" of animal nature. No science has in Britain undergone a greater change than this has done during the last half-century, or at least since the times when Smellie wrote and guessed, and the good-natured Goldsmith tried his pen, on what the world was then pleased to call Natural History; we mean, of course, the English world; for the writings of the illustrious Count de Buf-

* See Preface to Milne-Ewards's 'Manual of Zoology.'

son, now about to resume their just position in Science, proved, in France, so long as they were permitted to be read, an insurmountable obstacle to a return to that state of degradation to which the *parti-prêtre* had succeeded in reducing it in England. As that party existed on both sides the Straits of Dover, the question may be fairly asked, Why was not the success equal on both sides? The answer is easily made, and most satisfactorily. On the English side we had no Revolution setting free the human mind from the bondage of ages, and producing such intellects as those of Arago and Cuvier, Laplace and Fourier, Geoffroy and Savigny, Malus and Gay Lussac. With us, on the favoured side of the Channel, Sot George succeeded Idiot George; the English mandarins, with whom, of course, was the English *parti-prêtre*, successfully resisted the claims of men to be free; the progress of Science, especially of zoological Science, was successfully resisted; the labours of the Count de Buffon continued to be scandalously mutilated by English compilers to suit the taste of the English public; Paley's well-written, but superficial, erroneous and piratical compilation was the zoological text-book at the Universities, and by all respectable, correctly thinking people looked on as second only to Scripture; Gibbon's name could only be mentioned in a whisper, and to speak of Voltaire otherwise than to vituperate was sure to entail on the speaker or writer a torrent of abuse. In the meantime what did the great bulk of the people read on Zoology? Goldsmith's 'Animated Nature' and 'A History of the Three Hundred Animals,' that being the limit as to what was "useful to be known," and to which the English mind was permitted to aspire.

That the condition of zoological Science has changed materially since the period we speak of, even in England, is due to the labours of one great mind, George Cuvier, the anatomist. Before his time naturalists were not anatomists; indeed, before his era true anatomy was not understood; what passed for anatomy was as an instrument and method of discovery, wholly valueless in the hands of zoologists. He discovered the *descriptive*, and applied it. The result was—1st, the placing living Zoology for the first time on a sound scientific basis; 2ndly, the discovery of the signification of the fossil organic world,—a discovery which in some respects stands unrivalled in human history; 3rdly, a new "interpretation of Nature," which the philosophic world objected to, even before the death of the immortal author of the 'Ossemens Fossiles.' The facts he discovered are now universally known, and therefore require no special notice here. To these facts he of necessity tacked certain theories, or rather hypothe-

ses, in other words an "interpretation of Nature," which was, sooner or later, sure to be assailed. He resisted to the last the transcendental doctrines of Goëthe; the simple-minded Oken he looked on as a well-meaning, honest observer, but labouring under extreme delusions peculiar to the German or Gothic mind; Geoffroy, who, taking the same view of Oken personally, had yet adopted the greater part of his doctrine, was personally attacked by Cuvier in the Academy, where his great reputation silenced all opponents. With DeBlainville, originally his own assistant, equal to himself as an anatomist, Cuvier was more cautious; and this course was the easier to adopt, seeing that DeBlainville, up to the moment of Cuvier's death, had not committed himself to any theory,—to any interpretation of Nature. He has done so since. His facts are indisputable; but they admit, like most facts, of a variety of interpretations. Since the demise of the illustrious author of the '*Ostéographie*,' some of his views have been submitted, with all due caution, to the Academy, for that body would not even now listen to a direct attack on "le grand Cuvier," though backed by the deservedly great name of DeBlainville. Buffon, whom Cuvier so greatly and unfairly undervalued, begins to be mentioned, and zoologists have been found bold enough to speak of him as a great and illustrious man, a profound thinker and original genius. A matchless writer he was ever known to be, scarcely equalled, and certainly not surpassed, by Voltaire himself. But Cuvier had traduced his writings, holding them up superciliously to contempt; sneered at the amiable Daubenton, his anatomical assistant; boldly asserted that Aristotle's account of the elephant was infinitely more accurate than Buffon's, thus indirectly aiding the *parti-prêtre*, who never sleep, and who never, on either side the Channel, forgave Buffon, haters of truth and genius as they must of necessity ever be. By such means the unassailable Cuvier had lowered the reputation of Buffon to that of "a pretty good naturalist, who had described in a pleasing style the history of some mammiferous quadrupeds"!

Thus originated a new era, the Cuvierian. For somewhat more than half a century it has held, and perhaps still holds, undisputed sway over the scientific, I had almost said the intellectual, world. Its importance to man, it is true, has of late received some severe shocks in presence of other grander discoveries; the rail, the screw, the steam hammer, the diggings, the hot blast and the cold blast, the Minie rifle and the Lancaster gun, such things as these unquestionably throw the '*Ossemens Fossiles*' into the shade. Let us hope, however, for the honour of humanity, that civilization may never attain

that grand utilitarian climax when a moment's thought thrown away on anything but "the dollar" will be held as time lost, and the human Gorilla everywhere, in imitation of model England and model America, look only to the *essentially useful to be known*. And now, after half-a-century's triumph, the theories (not the facts) of Cuvier are openly canvassed and disputed. It is beginning to be admitted that had Buffon's works been more deeply studied (and, let me add, more fairly dealt with), France might long since have claimed for one of her sons the merit of having discovered the transcendental in Zoology, or, at the least, of dividing the claim with Germany; nay, what is more, of having produced a mind competent to grapple with the most difficult of all questions, the Philosophy of Zoology, that question which Cuvier, in the height of his reputation, declined entertaining, and which, when forced on scientific Western Europe by Etienne Geoffroy (St. Hilaire), caused him so much uneasiness. This question revived, we now purpose examining, aided by the vast discoveries of Cuvier and his school, of whom DeBlainville was the most illustrious, and, above all, by a profounder study of the "thoughts" of the author of the 'Epochs of Nature.'

To some it might seem that a new interpretation of Nature is all that Philosophy requires, and all that merits being considered here. But after the interpretation comes the application,—after the theory comes the practice. If the theory or interpretation be profound and unanswerable, it must, one would think, be universally received. Not so. It must also be in accordance with the spirit of the age, or mould that spirit to it. Even the laws of gravitation as established by Newton, the immutable laws of physics, admitting of no exception, are received as truths only by the thinking part of mankind, not by the mass.* Need we feel surprise at the rejection of the philosophic thoughts of Buffon, unsupported, as they assuredly were, by any material demonstration? The discoveries of Cuvier, on the other hand, were based on physical facts; and many of his deductions from these facts admitted of no sort of doubt. But it was far otherwise when he propounded his views on the structure of the globe, how it had been constructed by successive formations, how the animal kingdom originated in successive creations, implying successive extinctions, both miraculous in their nature, stupendous and beyond philosophy. Such doctrines were sure to be assailed, and, I may add, sure to be refuted. The refutation is still incomplete, but certain to come. But

* With them an appeal must ever be made to the senses,

before entering on this let me consider some of the laws which we know regulate living beings ; their growth, production, dispersion, before our eyes.

Clever men without a genius for discovery succeed occasionally in giving a new aspect to Science by a dexterous change of terms. The trick is stale enough, but it answers for a time, and this is all that is aimed at or even hoped for. Thus Bichat's classical arrangement of the animal functions into organic and animal become, with the modern physiologist—1st, functions of nutrition, and, 2nd, of perpetuation ; 3rd, functions of conservation.* The terms mean precisely the same as Bichat's ; but they are different terms, at least in appearance and sound ; and this suffices with most. The study of these functions constitutes Physiology, properly so called. The determination of the seat of these functions, or in other words their *localization*, has been attempted in every way, by the anatomy of the dead and of the living, by Pathology, by experiment on the living and dead. This method, the experimental on the living, invented by Galen, perfected by Haller, received from Bichat a scientific character, and was carried to its extreme height by Magendie and his school. It has benefitted Physiology, properly so called, a little ; but as an animal body is one, has general sympathies and cords of unison, so a single pathological fact has occasionally overthrown the finest and clearest of the experimental theories. A disordered liver may give rise to mental aberration, or a blow on the head produce an hepatic abscess. Experimentalism explains nothing of all this, and never will.

The general physiology of animal beings, on the other hand, is different, and has been arranged under four heads :—1st, the specialization of beings ; 2nd, the formation of beings ; 3rd, the diffusion of beings on the surface of the globe ; 4th, the diffusion of beings in time, or in the different ages of the globe ; to this may be added, 5th, the extinction of beings in time, a mystery quite as inexplicable as their formation. The beings referred to here are animated beings, or animals, whether now existing or extinct. To view these, the fossil and the living, as distinct, apart from each other, as Cuvier did, seems erroneous, as well physically as metaphysically. The view implies successive creations or formations, which comes to the same thing, of new genera and new species,—the constant interference of a first cause. So sensible was Cuvier of this violation of the principles of all philosophy that he at times denied, in the most positive manner, that such

* Fleurens.

was in reality his view ; but he always clung to or returned to it, and towards the close of life more obstinately than ever. A German by race, a French citizen by the accident of birth, but, above all, an anatomist, sceptical in the highest degree, disbelieving what he could not see and touch, he held in extreme dislike the pantheistic doctrines of Southern or Slavonic Germany, their inventors and supporters. To him the transcendental in any form was odious ; and if anything could bring the dead from the tomb it would be the announcement that his anaplotherium was really nothing more than an overgrown baby-ruminant ; that much-doated-on skeleton which it was so easy for him to prove belonged neither to a horse nor an ass, a pig or deer, an ox or buffalo, a tapir or rhinoceros, nor anything now alive, or which had lived since man began to notice the difference between a horse and a pig, an era assuredly of no mean date,—that skeleton which, being explained or interpreted, created Palæontology, bestowing on Cuvier an immortal fame. Whilst Cuvier lived no transcendentalist had ever ventured thus to assail the very basis of the doctrine of the great anatomist.

Palæontology derives much of its importance from this,—that many more species and genera of animate beings have been destroyed than now exist. Zoologists admit as lost forty thousand species of shell-fish, forty species of the pachydermata, and one elephant at least ; of hippopotami seven or eight species have been lost, besides reptiles and fishes innumerable. Now, in what light are these lost species and extinct genera to be viewed ? Under what aspect are they to be intercalated with the living ? If intercalated as DeBlainville proposes, they fill up the gaps in the scale, and out of the living and the extinct, the present and the past, is formed one great chain of beings. This unity, this scale of beings, Cuvier denied. Assumed by Bonnet and Buffon to exist, its rigorous demonstration was attempted by DeBlainville, a descriptive anatomist equal to Cuvier himself. Giving up as untenable, 1st, the successive creations of Cuvier, and, 2nd, the simultaneous formation and creation of all species at first (a doctrine hinted at by DeBlainville), as doctrines disproved at once by palæontological research, there remain still to be accounted for the existence of certain species and genera in time and space, and the appearance on the earth of species and genera which at one time did not exist. If the descent of the living from the extinct cannot be proved in one form or another, the doctrine of the unity of the scale of beings is a doctrine not worth maintaining. There cannot be two modes of creation or formation of animals,—two principles working the machinery

of the universe. It must be philosophical or nothing, and if philosophical it of necessity excludes the miraculous. An English statesman (such a statesman!) boldly declared, at a public meeting of agriculturists (a class of persons not remarkable for philosophical inquiries), that "the discovery of gold in Australia was simply a merciful dispensation of Providence to meet the wants of a superabundant English population." * But why not go further, and say at once that the gold was formed there, a few years ago, in order that it might be so discovered? And why not say at once, for this conclusion is aimed at, that it was expressly formed for the use of the Anglo-Saxon race? On the other hand, a similar discovery had been made, a few years before, in California, by a section of the same race, a very amiable, Christian, mild and gentle section of the great English family, remarkable, above all, for a truly Christian philanthropy, and who have turned the discovery to the best account. How are we to explain this? There is but one way: reject the hypothesis, and all such, as a scandal to the era in which we live, a libel on human reason and an outrage on common sense. †

In support of the doctrine of a unity of all created beings, an uninterrupted scale of life from the commencement, we have had—1st, the theory that all living things are convertible into each other by external circumstances; ‡ 2nd, the same doctrine formulated in a more philosophical way, § and better adapted to the existing state of Science; || 3rd, the theory that all species were formed as they were, and now are, at first, and perhaps simultaneously, thus constituting *species* everything in Nature, and viewing generic characters merely as the result of modifications of species affected by time and circumstances, or even as being in themselves of little or no moment in philosophy; lastly, ¶ the theory that, admitting species or specialization to be the great aim of Nature in the construction of the organic world, it is not the sole aim, nor do specific beings solely form Nature; that genera or natural families form a portion of Nature's great scheme; that perpetuation by a parentage is *generic* as well as *specific* proved by the fact of certain animals passing their lives and perpetuating their kind,

* Speech of Sir John Pakington, as reported in the 'Times,' 1856.

† Such ideas are peculiar to the Saxon race, and especially to that section of it which we find in England where the "whitened sepulchre," lay and clerical, most abounds.

‡ Lamarck.

|| De Blainville.

§ Goëthe, Oken, Geoffroy.

¶ Knox.

for one or more generations at least, under a *generic*, and not a *specific* form, and by the fact, admitting of demonstration, that, even in the highest forms of the vertebrate animals themselves, the young, up to a certain point, is a *generic* animal in its natural-history characters, and not specific, but with this additional remarkable circumstance, that it combines in itself the natural-history characters of all or most of the species of the natural family to which it belongs.* Adopt this view, and it explains to a certain extent, if not the disappearance of species in time and space, the coming upon the stage of life of other species seemingly new, but which are not so, being merely the development of specific forms which lay concealed in the genus or family. Agreeably to this view, generic creation at least is universal, applicable to countless generations. Specific appearances, on the contrary, are accidental chapters in the history of the globe; species perish, genera persist; the embryo of the future organic world lies concealed in the present, as the embryo of the present lay wrapt up in "the past." The compensation spoken of by some† as a *natural* compensation is wholly *human*. "If species," say they, "die out, individuals multiply; and this compensation is in favour of mankind." The theory has a strong odour of the present utilitarian age; nor is it a fresh theory in any sense of the term. "All things were made for the use of man," to have dominion over and to turn to account; but as most of Nature's productions are useless or even detrimental to man's interests, the way to turn them to the best account is no doubt to destroy them, their existence and his being incompatible, substituting in their place the useful. M. Isidore Geoffroy (St. Hilaire), with the fondness of a naturalist for Nature's works, proposes the naturalization of some of the beauteous and harmless animals with which she has peopled the globe. Not so says his colleague, the more acute, practical M. Fleurens: these things, he remarks, look well in museums and natural-history collections, but are not to be compared with sheep and oxen, horses and pigs. Improve these, says the astute follower (at an immense distance no doubt—so distant indeed as almost to have lost sight of him) of the immortal Cuvier; improve the domestic breeds formed by man; follow the English, the only people who understand the true fattening of domestic animals; extirpate Nature's works which are useless to man, and cultivate henceforward only the flora and the fauna comprised in the scant vocabulary of the farmer and the market-gardener. Alas! for that Academy where sat Geof-

* Knox.

† Fleurens.

froy and Cuvier, Laplace and Ampere! But the *industrial* will have its day, and for the honour of mankind let us hope it may be as brief as possible. Of impure origin, and suited only to the muddy banks of the Thames, let us pray for its speedy extrusion from halls which once echoed to the sublime language of Cuvier and Geoffroy, Arago and Laplace.

The aim and object of the various branches of knowledge now cultivated under the names of Physiology, human and comparative, Anatomy, human and comparative, Zoology, Palæontology, Biology, Morphology, Embryology, Transcendental Anatomy, is one and the same, namely, the Philosophy of Zoology,—the right comprehension and interpretation of the nature of animal beings, their relation to each other and to the globe they inhabit,—their history, in fact, in time and space. This fact has been long recognised and admitted, as also the probability that, in the history of the mutations and transformations of the animal from its embryo to its adult condition, or from its generic,* or perhaps even a still more highly generalized expression, to that specialized form, becoming, as it were, acclimatized and specialized, it assumes a form recognised by man, and all that lives lies the grand secret of philosophical anatomy: thus the great questions of this sublime and mysterious history may certainly be embraced—1st, in the specification of beings; 2nd, the formation of beings; 3rd, the diffusion of beings in space; 4th, their diffusion in time. These truths have been long known and admitted, from the time when Etienne Geoffroy (St. Hilaire) called the attention of the Academy of France to the theories of the transcendental. Goëthe and Autenrieth had done this long before in Germany, but these great men lived unhappily before their time, than which there can be no greater misfortune.

Buffon said that *species are the only beings in nature*; but of this word "species" he made an abstraction: it was the fashion of the day; men were still fond of the metaphysics of the old school, and Buffon was no anatomist. The idea of species is no doubt an abstraction and generalization, but one of the simplest, to which even the lowest animals are equal. To arrive at a practical knowledge of species, as distinct from the individual, is just as easy for the Bushman as for the most learned professor of Natural History, and sometimes much easier; but Science demands a *definition*, and zoological science requires species to be defined; Cuvier's is known to all the

* KNOX.

world; he defines species to be "the re-union of individuals descended from each other or from common parents, and of those resembling them as much as they resemble each other." In a matter so difficult as the definition of species this definition is comprehensive enough, and answers most purposes, but, on analysis, it presents some difficulties, and it has therefore been proposed to limit the definition of species simply to the test which Horace long ago gave us, which the common sense of mankind proclaims and even demands as an inviolable law, namely, to the character of resemblance solely; others have proposed the leaving out resemblance and confining the definition to continuous uninterrupted descent or reproduction. It has been said that the idea of resemblance is an accessory idea;* but how accessory? The idea of reproduction, on the other hand, is said to be a fundamental idea. Would it not be more to the purpose to call the first the sole *practical*, the second the *experimental*? If, on the field of an unknown land, we meet an animal of the bovine or equine kind, ovine or porcine, would not the most illiterate, if experienced, be in a position to say whether the animal was identical or not with others he had already seen? But it may be said, the question still remains, as mere resemblance is deceptive, how are we to prove this unknown animal to be of the same species as the already known? To answer this question the scientific man resorts to the method of experiment: if he observes this new kind of ox or horse to breed freely and continuously with those already known, then it is held to be of the same species. Now, notwithstanding its seemingly strong position, nothing can be more fallacious than this experiment. Mankind is generally viewed as composed of varieties, and not of distinct species or races, yet these varieties, as they are called, have never permanently mingled so as to give rise to a hybrid race. In this view, then, they cannot all belong to the same species: the supporters of the theory may, however, be disposed to concede this, and we must look, then, for another argument, not against the reality of the test by reproduction, but against the misapplication of the doctrine. All the races of sheep are said to breed freely with each other, and therefore are of *one species*. We confess to great doubts on this point: so with the horse and the ox. Race is said to be artificial, species natural: it must be admitted, however, that some races strongly resemble the natural,—have a wonderful power of endurance and of resistance to all external circumstances; the Negro is precisely what he was when the Egyptian tombs were hewn on the banks of the Nile, some four or five thousand years ago. If there be a hybrid breed of men on the earth it is the modern Turk, and they are fast becoming extinct. The test by reproduction is no doubt the scientific test *par excellence*; but, in a practical point of view, the test by resemblance is much superior,—not by the resemblance of the interior, of the skeleton, for example, but by the dissemblance or resemblance of the exterior. In as far as the skeleton is concerned, the ass and horse obviously resemble each other,

* Fleurens.

and confining one's views to this, which we might be forced to do were they palæontological subjects, they might be, and would have been, declared to be of the same species: so with the zebra, the quagga, &c. Now look at the exterior, and say where is the possibility of mistake. But it may be said, this idea of resemblance of the interior and dissemblance of the exterior would not enable you to decide the question as to the identity of the nature of both. No science of mere observation is equal to this; the profoundest zoologist that ever lived could not, by any *à priori* reasoning, have foretold that by the union of the horse and ass we should have a mule, partaking somewhat of the nature of each parent, and that this mule should be barren. It is experiment alone which decides such questions, not Science. The probability is that the product of the ass and quagga, or zebra, of the zebra and the horse, of the zebra and quagga, would, in like manner, prove a barren mule; but nothing of all this is certain until tried. Zoology, or the doctrine of life, must not be mistaken for a fixed Science.

Continuous production is the characteristic of species, but *resemblance* of the product to its parents must also be superadded. The domestic dog differs in almost every country; it has been assumed that all the so-called varieties are reproductive with each other, and are consequently of one species. These assumptions are hasty and gratuitous; the same has been said, on no better grounds, of sheep, oxen, horses and men. Continuous production is easily asserted, difficult to disprove. Since the grand era of Cuvier, naturalists have been anxious to maintain for their favourite pursuits the elevated position bestowed on them by one who worthily contested precedence with the foremost of scientific men. But the Cuvierian era is past and determined,—its position fixed in the *history* of Science; it admitted of few abstractions,—it rejected the transcendental, the transformations of the embryo, and even, in some measure, limited and restrained and defined the powers of Nature: these mistakes are now seen and admitted. Let us proceed.

The dog and the wolf reproduce with each other to the third generation, but no further; they are then of different species: had it been otherwise the world would have been harassed with a dog-wolf, to distinguish which from the pure would have puzzled Linné himself. The dog and jackal reproduce to the fourth generation; "but the dog and fox never have any offspring when united: they are then of different genera." It would seem, then, that in zoological Science all is experiment and observation. The hyena and dog are in the same category; they belong to different genera, if this test be accepted as certain and real. But a very few years ago mankind was assured by the most distinguished of living zoologists that the idea of species was fast disappearing from human thoughts; now we are told that *species are the only beings in nature*—that they constitute the *primitive forms*! Why, then, have the young *generic* forms? Why have some of them forms which belong to the past or extinct world? Why do individuals grow up to the adult condition, occasionally with forms not constantly found in their species, nor genus, nor even class,

at any period of their growth? Must we, to explain these phenomena, go back to the old *jeux de la Nature*, to accident and chance, to providence and the will of God? What is the meaning of forms, clearly arising from arrested developments, and of others as distinctly traceable to retrogressive developments, but this, that adult species may, after all, be only the individualized expression of certain forms of life alone compatible with the existing order of things, as formed by and out of this order itself; the basis, in the mean time, out of which the living species springs—the *trame*, if we may so say, being but one with the extinct. In no other way can we readily connect the past with the present, the present with that future which is sure to come. The future, it is true, may be a world lifeless, cheerless, rolling through space for millions of years, such as palæontologists supposed it to be at the commencement: we have no faith in either conjecture.

The modern theory, then, is that a continuous fecundity implies species, a limited fecundity genus. All sheep and all cattle are conveniently assumed to possess (although this has never been proved) a continuous fecundity, and therefore are, respectively, of one species; the horse and the ass have a limited fecundity, and are therefore of different species, but of the same genus; the dog and fox do not breed at all with each other; they are, then, of different genera. Beyond these, it is true, there may be no consanguinity by parentage or reproduction; but what is this to Nature? Is it merely by way of amusement, and to display her powers, that the embryo is found to pass through so many of the same forms of life before attaining the higher, occasionally reversing the process, and undergoing a retrograde development? What precise meaning do zoologists attach to the term *parentage*, when applied to different species of the same genus? According to one hypothesis, this is at least comprehensible: "The young of all the species of the same genus possess at first all the specific characters of the different species of the genus."* Unquestionably we have here *parenté* of a deep character, and one which Nature might turn to account. The conversion of one of these species into another cannot be so difficult a matter with Nature, especially when all or most of the specific characters are already present in the young. Thus a given species may perish, but another of the same *consanguinité* takes its place in space: it is a question of time, not of new creations; it is but the successive developments of species from one great family. How that family or genus stands with others has not been as yet explained, and can only be by Palæontology, which gives us the matured specific and individualized forms of what, in the living embryo, we can only guess at. The vertebrate have the most positive relations to each other in the unity of their organization, and especially of their skeleton. Thus *parenté* extends from species to genus and from genus to class and order, in characters not to be misunderstood. Cuvier maintained the doctrine of the *fixity* of species,

* Knox, in the 'Zoologist' of 1856.

and modern zoologists have boldly added, that no *species closes its career naturally*, meaning thereby, that all meet with a violent death : * they would fain go further than this, and hint at their extermination by man,—a dangerous and most improbable doctrine,—a hypothesis unsupported by any proof, even in the case of the dronte, which, we are told, was exterminated by Portuguese sailors. † Species, we are told, have disappeared as a consequence of external violence, otherwise they would have been perpetual, fixed, eternal ! Assumption again ! for it is not species alone which have perished, but genera and forms of life wholly distinct from the existing order of things. Why perished the ancient vegetation, so unlike the present, and whence came the present, but from the past ? That species have remained fixed since the time of Aristotle, and long before, is a fact which must be taken in conjunction with this other, which we owe to Cuvier : “There was a time when the present organic world did not exist, but another, or rather other forms of life wholly distinct.” If species, then, are fixed, historically or in man’s recollections, they are not eternal as regards the past, nor the future if it is to resemble the past : nor can we altogether depend on what we see : it is but the other day when the tænia and the tænioid forms of animals were declared to be specific forms ; now we know that they are not so,—they are *generic*, if we may so say ; they can even for a period retain this generic form, maintain an independent position and propagate their young, as if they were individualized, specialized adult forms. These discoveries, the result of direct experiment, are but of yesterday, but their importance in discussing the theory of life is vast, and can scarcely be overrated. The reply of Cuvier to Geoffroy and the German school, who maintained the direct descent of the existing species from the past by a modification or degeneration of the fossil species,—namely, that were it so the modifications ought to have been gradual (*graduées*) ; “there ought,” said he, “to be a series of shades between the fossil and the actually existing, and traces of such modifications ought to be found in the interior of the earth, yet we find them not :” this objection, which seemed so probable at the time, is being met, and may shortly be fully answered. These *shades* are being daily found, and this has been distinctly proved by De Blainville ; 2nd, if we adopt the theory that all generation is *generic* ; ‡ that specializations of every kind depend on the nature of the existing order of things ; that if certain of the modified forms filling up the great scale of beings be not yet found, it may arise from this, that these forms have not yet been called into being, and cannot therefore be found ; then the objections of Cuvier, at the best somewhat trivial, as referring solely to historic periods, fall to the ground. The living species, then, are not absolutely new creations ; but, in whatever light this may be viewed, one thing seems certain,—the utter falsity of the doctrine of Aristotle, who fancied that Africa’s ever-varied and glorious Fauna arose out of the scarcity of water, which, bringing to her

* Fleurens.

† Id.

‡ Knox.

widely-spread and scantily-supplied springs all species of animals, gave rise to those ill-assorted unions terminating in the production of new species. The *arida nutrix leonum* has, from time immemorial, been celebrated for the production of what was new ;* so said Horace, and the adage is still true, though not in the sense of the illustrious author of the ' *Historia Animalium*.'

The question of the fixity of species first assumed a scientific form in Cuvier's hands ; he based his view on the skeleton, but, as a scientific man, he was candid enough to admit that between the presumed fossil and the living organic world the differences, in many instances, scarcely amounted to specific. This occurs in the horse, dog, ox, elephant, &c. ; notwithstanding, he viewed them as specific and distinct on other grounds, and in this we feel disposed to agree with him : not so De Blainville ; with him the *Elephas primigenius*, the mammoth of Cuvier, is of the same species as the living Asiatic ; the same view he applied to many carnivora, pachydermata, &c. But now one of two things ; the primitive elephant, the mammoth, and the so-called fossil horse, ox, bear, dog, &c., either were identical with those now alive, or they were not. The question of identity, we hold, cannot be decided by any examination of the *skeleton* alone, for who, looking at the skeletons of the horse and ass, the zebra and quagga, and Tsazitaï, and observing their strong resemblance, not to say identity, could ever have imagined them to belong to species, perhaps even genera, so distinct from each other as they in reality are, had he not been forewarned of the fact by a knowledge of the entire and living animal ? So it is with the mammoth, bears, &c. ; but let us suppose them to have been of the same species, then it must of necessity be admitted that the dawn of the present order of things, as Humboldt has remarked, must have penetrated much deeper into antiquity than is generally supposed, or, to express it in simple and not mythical language, the appearance on the earth of the existing species of animals counts from an antiquity which upsets not merely Bishop Usher's chronology, but every other hitherto offered,—even the modern and most orthodox palæontological. And here the position of the horse, dog, &c., merits a passing remark : if the presumed fossil are identical with the living, what becomes of the fine-spun theories of naturalists ascribing to man's influence, by domesticity, the origin of the domestic horse, ox, dog, sheep, &c. Goëthe affirmed that the domestic ox was the direct result of civilization and domesticity acting through a million of years. Man, then, lived a million of years ago. Goëthe's theory can scarcely be the true one, in any sense. What has domesticity done for the ass and the elephant,—the camel, and, we may add, the lama ? From the remotest times these animals have been subjected to the influence of man, and yet over them that influence has been pointless. This difficulty Cuvier not only instinctively foresaw, but was forced to listen to towards the close of his great career. The resemblance, not to say identity, of

* "Aliquid semper novi Africa offert."—*Hor.*

the fossil and living horse, the fossil and living dog, &c., was obvious; so with many of the bears, carnivora, &c.: now this difficulty he might at once have repelled by pointing to the resemblance of the skeletons of the horse and ass, which yet form species absolutely distinct. But to have used this argument was to employ a double-edged sword, to be rapidly turned against himself, upsetting much of his anatomical researches, and his great aim of proving, upon anatomical grounds, that the fossil and living worlds were absolutely distinct. Again, when Huet and other distinguished palæontologists and geologists, pointed out to him the undoubted discovery of the remains of man himself in geological positions, the vast antiquity of which could not be doubted, and the simultaneous occurrence of these remains, both with the recent and the extinct world, thus seemingly uniting all in one series; Cuvier was silent on such occasions, and his silence was very naturally respected by the Academy. Thus, long prior to his death, the illustrious man must have foreseen that he had opened up a fountain of discovery, to the flow of which man could set no limits. If man succeeds better with the ox and horse, the dog and sheep, the rabbit and pigeon, it is because in these genera there are several species, by the combining of which *breeds* (not *races*) are obtained, showing those numerous varieties which modern naturalists* mistake for races,—which men maintain for a time by force of circumstances,—which, unless thus maintained, have a constant tendency to revert to the primitive species from which they sprang. As with animals, so with man. South America, conquered by Spain and Portugal, in other words, by the Lusitanian, Celtiberian and Iberian races of man, witnessed the growth, for a century or two, of a heterogeneous population, somewhat analogous to our mixed *breeds* of sheep and oxen, horses and dogs; and now that the European race ceases to emigrate to that land, the artificial, forced, unnatural and unleavened mass frees itself of the accessory and accidental elements,—the Mulatto dies out, as he must always do; the pure white and the Indian, the Negro and the Carib, return to what they were. If man has reason to boast of his mixed breeds of cattle, the world has but small reason for congratulation in the production of mixed breeds of men. Look at the savage cut-throats who have desolated South America, the so-called Mexicans and Peruvians, the Monte-Vidians and Buenos-Ayreans (as if there ever was, or ever could be, any such races), and admit that, unlike those of the West, whatever be the faults and foibles of the pure races, they are at least intelligible to humanity.

But we have been drawn away from the simple question of fixity of race or species, which Cuvier and De Blainville, though in different ways, maintained, and which Geoffroy and the German school as stoutly denied. The possible existence of a hybrid species was long ago denied in this country,† and the assertion has received the sup-

* Eleurens, &c.

† 'The Races of Men: a Fragment,' by R. Knox.

port of many painstaking naturalists of the United States of America: it is now, we find, beginning to be admitted in France, after a sharp struggle, no doubt, and the limits of fecundity in the hybrid breed are being clearly defined experimentally. It is quite right that such experiments should be made, although they do not lead to any important practical results. To prove a hybrid race to possess continued fertility there must be no return to either of the pure species to which the hybrid owes its origin. The she-male, sterile with the he-male, is said to become fertile by a union with the ass or horse; that is, by a return to one of the primitive races. Whilst agreeing with modern French authors that more numerous experiments are required on this curious and interesting subject, it may be laid down as a law that no hybrid race is continuously fertile, and that it was not by this means that the world became peopled with the innumerable species revealed to the scientific by the living and fossil worlds. Other causes must, then, be looked for, and there can only be two; 1st, the influence of the external media on living forms as they then existed; 2nd, certain unknown laws of life which bring into existence certain forms to the detriment of and the extinction and exclusion of others. The scientific will, we think, excuse us from seriously discussing a third mode as probable or even possible; the sweeping all living things from off the earth, and the creation of new organic worlds. Even the compilation ascribed to Moses did not go so far as this; it preserved a stock of pairs, human and brute, out of which the coming races, not new, were to proceed. Cuvier's followers in England made great use of certain expressions in Cuvier's works, expressions which he repeatedly and most formally denied. These ideas remain in vogue even to the present day in model England, where a theory which does not pay is very naturally scouted and laughed at. The theory we allude to, first mooted by Socrates, advocated by Philo-Judæus and the Dutch author whom Paley pirated, worked practically in England, produces to a certain class something like six millions per annum: it must be a good theory, and of this no reasonable man entertains a doubt. The date of the descent from Arrarat is no doubt a puzzling question, but it is only so to those who cannot be made to believe that the electric telegraph equals, if it does not exceed the stupendous miracles of antiquity.* Illustrious theologians! we wonder how any of you escape the fate of the unfortunate author of 'Geology reconciled with the Chronology of the Mosaic Deluge;' it must be that you attach no special meaning to your words, and care but little how Science wars against the horrors of ignorance, so long as "the accidents" of your sacred offices are left untouched.

The various species of animals which, since this orb commenced its career in space, have decorated the earth, have not arisen from any mixture of a few primitive species; from the time they appear on the earth, these species seem unalterable and unaltered until their extinction; but others appear distinct from the extinct, yet related to them:

* Dr. Cumming's Sermons and Discourses, *passim*.

what is the nature of that relation? Is there consanguinity? This is really the important question, in a philosophic sense, and in its solution is involved that other, namely, the unity of the organic world.

Is *species* always young, or is it *genus*? It must be the latter, if the young be born and partly grow up with *generic* characters; else whence these characters? If the dentition of the young of every species of the Salmonidæ, for example, be identical or nearly so,* that is, if the character of the young be *generic*, in the widest sense of the term, what right has generation to the title of specific? Simply because experience tells us that, whatever be the form of the young, the form it must in time assume will ultimately be that of the parent. This specific influence, always present, does not show its powers suddenly or at once; it strengthens with the growth of the young, and may be, to a certain extent, checked but not destroyed. On this subject we have few observations to be trusted, and still fewer experiments. Travellers still talk coolly enough about the Portuguese, who, living within the tropics, have blackened to a negrine dye; no reasoning person believes in such nonsense now; nevertheless, the story is still repeated. What the European races—the Scandinavian, for example—might become, if located in a tropical country and forced to trust to their own resources, without any draught upon fresh imports from Europe, it were difficult to foretell,—nothing can with safety be predicted in the sciences of pure observation. Such a race would probably become extinct in no long time, together with all the European animals imported into the country. But, in fact, we have no data to enable scientific men to arrive at just conclusions on such points as these. The influence which external circumstances are adequate to exercise on the living organic world must at all times be small, imperceptible, as diffused through countless ages,—lost in the gulf,—the abyss of time. Besides evidences of the most terrible cataclysms, producing no doubt geological epochs, are evident everywhere, and the influence of these cannot be calculated. The conversion of the *generic* product of all animals into the specific is thus a mystery, but it seems to be one which includes, could it be explained, the extinction of certain species and the appearance of others; in other words, it explains the fossil and the present organic world, and their relation to each other.

It may now be admitted that neither man nor accident can form or give rise to any new species, to replace those which—thanks to the illustrious Cuvier—we know to have become extinct. How is it with the productions which naturalists have hitherto called *varieties*, which some are disposed to call *races*, by which no doubt they can only mean *breeds*, the consideration of which they seem inclined to elevate to the dignity of a scientific question. What is a *breed* and what a *race*? Unquestionably a race means a species, implied almost by the popular meaning of the term. When we say Anglo-Saxon race, we

* Knox, in the 'Zoologist' and 'Lancet' for 1856.

mean a collection of men clearly and unmistakeably descended from the English, they again from the Scandinavian; by Celtic *race* we mean a body of men who have never altered in time, nor under any circumstances; we say the same of the Coptic race, for whose perpetuity, continuous fecundity and uninterrupted descent from the earliest of recorded times we have monumental proofs of an incontestable character; nay, what is more, there exists not in the land of Egypt any intermediate race, so that Cuvier might have selected the Copt, just as fittingly as the sacred ibis and the crocodile, as a proof that species or race was fixed and unalterable, at least for the trifling space of 4,600 years, that being the extent to which he carried his view. There is, there can be, no occasion, then, to alter the meaning of the term: race means species. What is the meaning of breed?

That individuals vary in form, in proportions, within certain limits, is what must be known to all the world; that these varieties have a tendency to *hérédité* has also been long known. The tall produce the tall,—the short, the short; but to these laws,—1st, tendency to variety, 2nd, tendency to *hérédité*,—there ought to be added a third, which naturalists and theorists are apt to forget, and even to affect to ignore; it is the tendency to return to the type of the race, or to perish altogether. When the variety proceeds to a certain point, the individual becomes either non-viable or ceases to be productive. Hence the type prevails and is perpetual; varieties perish or cease at least to appear. It has been explained on the principles of the transcendental,* as being a perpetual struggle between the laws of generalization or of unity and the laws of specialization, and until some better reason be assigned there is no occasion to view it otherwise. But still there remains the question, Are such varieties or breeds perpetual? We think not, unless an artificial means be resorted to in order to maintain them. It has been said that they may be maintained by domesticity, but this is wholly artificial: as we know not from how many species these domestic animals spring, and that the action of domesticity never ceases, so it is impossible to say whether men be experimenting on races or their varieties. Who could tell the result of a union of the Asiatic and African elephant, and whether or not there would be any product? what form the product would assume? whether or not it would prove a fertile hybrid, to a certain extent? All such are questions which can be answered in no other way but experimentally. The most remarkable instance of the influence of climate and the removal of the slavery of domesticity over animals, would be the return of the domestic pig to the wild boar and of the domestic sheep to the argali, when abandoned to themselves in the wilds of America; but these assertions are far from being proved. In Zoology all is experimental or the direct result of positive observation. Who could explain or imagine why the pigeon should invariably lay two eggs at a time? that these should as invariably be male and female? and that,

* Knox, in 'The Races of Men' and in 'The Artistic Anatomy.' London: Renshaw.

with almost equal certainty, the male egg should precede the female? Anatomy shows us that varieties of forms in the interior structure of man are exceedingly common, and yet that there is a law to which Nature most generally adheres even in such varieties. Retrograde developments, also—*i. e.* developments of inferior forms—are exceedingly common, perhaps most frequently in man; and here it may be worth while, before proceeding to higher considerations, to larger generalizations, at least in the history of animal beings, to consider the question of Man himself, and his relation to other animals.

Is Man an episode in creation? At first sight he seems to be so, for he is the only animal directly antagonistic of all that lives, adverse to his own interests. Now this includes nearly the entire of Nature's grand scheme in the construction of the animal and vegetable world: of the *wild* as it came from her hands he is the merciless antagonist. But this great question has been treated of elsewhere, and, in so far as we know, the view offered in that work has not been refuted. Of the original species placed on the earth by Nature man selects those adapted by their inherent nature to be useful to him. Sociability is one of the more remarkable of the qualities these species exhibit, but it is not the cause of domesticity, as some have supposed,* for vast numbers of animals are sociable without being thereby domesticable; all the antelopes, for example, the zebra and quagga, numerous species and genera of birds, the seals and dolphins, and many others, all strictly sociable, but not domesticable; whilst of those he has succeeded in domesticating only a few have admitted of those changes which domestic slavery is assumed to occasion, namely, the formation of *breeds*. The ass remains nearly unchanged, so does the camel and the lama, the elephant and some others. His most remarkable conquests in this way are the ox, the horse and the dog; but the question is still an open one, in how far the domestic breeds of these animals are derived from one or from several distinct species. As man is sociable and domestic, these qualities might be presumed deeply to influence his character, to have effected alterations, aided by other circumstances, on his physical structure and moral character; and if the hypothesis be admitted that he is of one species, then all the various forms he presents over the earth must be attributed to these causes. Now the identity of human nature is a grand proposition, as to which all great historians, statesmen and philosophers are agreed, from Herodotus and Xenophon to Voltaire and Gibbon. But the same may be said of most large natural families or genera, as of antelopes, for example, and buffalos; we do not, however, affirm from this only that these genera are composed of a single species: on the other hand, it has been remarked that all other species of animals have neighbours or relations (*"voisines ou de consanguines"*), whilst man has not. I know, however, of but one anatomist† who denies the existence of any anthropomorphous apes, that is, who asserts that the supposed resemblance between man and apes arises merely from an incorrect

* Fleurens.

† Myself.

appreciation of human anatomy, and that, in point of fact, no such resemblances really exist,—who has asserted that, anatomically, there is a gap, a link, not yet filled up between the bimana and the highest quadrumana; but he also thinks that, as in Nature's scheme there can be no deficient link, that the *scale* must be perfect, so this gap will be filled up in time by fossil discoveries or by the further development of life on the globe. Close consanguinity, then, between the human kind and any other animal is thus denied, both by the anatomist and the naturalist; by the anatomist, on the ground that the pretended resemblances found by the merely comparative anatomist arise from his ignorance of minute human anatomy; by the naturalist, on other grounds, no doubt, but mainly, I presume, on the fact of infecundity of union between the different species or genera, or (to use the phrase of modern naturalists) there is neither *continuous* nor *limited* fecundity, and so there is no consanguinity; that is, there is no common parentage, either specific or generic. On this latter point we want the evidence both of the anatomist and of experience, and so the question must be allowed to remain where it is; Science offers no aid to its solution. In the matter of experience or direct experiment, it has been said, but on no safe or assured ground, that the opinions of the wild Bosjesmen, natives of the Calihari desert, and of the arid regions through which the beauteous Gariep rolls its silvery stream, are in favour of both forms of fecundity, that is, of the specific and generic, and that the union of the gigantic baboon inhabiting these wild regions with the Bosjesman is prolific. It is a curious fact that, in speaking of this almost incredible circumstance, they (the Bosjesmen) speak of the product as a male, thus in one sense supporting and in another refuting the law established by Buffon, that as regards the product of different species, the male influence predominated to a remarkable extent; but the Bosjesmen affirm that, although the product be male, the form is strictly human or nearly so; also the moral character. On the other hand, we find in a newspaper notice of this day (June 25) that, in the little island of Tristan da Cunha, there are about seventy-two persons, the produce of one English artilleryman and a few men-of-war's-men with some negresses brought from St. Helena. The present progeny are said to show very little of the black blood, but to be a really good-looking, strong race of people. About thirty-five were desirous of leaving the island with their cattle, &c. But it is with regret I have to observe that such observations are in no way to be depended on, and are indeed of little or no value. As neither Science nor experience enlightens us on this extraordinary point, nothing can be said for or against the opinion: the practical view is the safest: go back to the monumental records of Egypt, and you will never find depicted on them any men or any animals which cannot now be perfectly recognised. Had such monstrous unions ever been productive, we have the evidence of Herodotus, to prove to the most sceptical on this point, that the moral code of ancient Egypt was sufficiently lax to have tested the result of such unions in such a way as to leave nothing to be desired.

Buffon, always rising to great ideas, said that man was the same everywhere; to this some have since added that a continuous fertility of all the breeds, races, species or varieties, is proof of the identity of his physical and moral nature.* This I denied long ago, and most American naturalists and anatomists now admit the correctness of my view. It is, then, an open question. Certain West India islands show an alarming tendency to revert to a *black population*; the white blood and the Mulatto must there be becoming extinct. The aboriginal Peruvian and Mexican gain, it is said, unmistakeably on the Spanish race; the successive conquering races of Northern Africa have all become extinct or nearly so, and the Tuaric and the Tibboo, and Kabyte or Boobas, return to their primitive abodes. We have nowhere on the earth any mixed breed of men; all the races are just as easily to be recognised now as they were in the time of the Pharaohs, who lived long before the Mosaic era; you may see them on the Etruscan monuments; it is a historic fact, of which Cuvier made great use in his theory of successive creations and fixity of species. If the fact be admissible as of value when applied to animals, it must be equally so when applied to man; and even if it be asserted that the races of men are *breeds* and not *species*, we only add another Natural History enigma to those already existing, by giving to *breeds* a perpetuity and a continuous productive energy, which we know they do not possess. When *breeds* of animals are transported to foreign climates they invariably alter if allowed to roam at large; man does not do so. The Hollander transplanted to Southern Africa, to Java, or to Northern America, undergoes no change morally or physically; it is the same with the Celt. If these be *breeds*, they have a strange tenacity and fixity of character amounting almost to what we usually term specific. The Gipsies have for centuries wandered over Europe and Asia, exposed to all the inclemencies of the seasons, but they remain precisely as they were originally; of the Jews we need say nothing; they speak for themselves, attesting the indomitable character of race, morally and physically, under every government and every climate. It is the same with all the races of men.

The specialization or specification of beings is the question we have just considered. By some it is referred to a first cause, and considered as primitive, eternal and fixed.† Those who maintain such views must also be prepared to deny the unity of life, of the organic world, the unity of the organization of animal beings, and, in a word, the dependance of the present organic world on the past. But, strange to say, they do not; on the contrary, they seem to think all these hypotheses compatible with each other. Let us follow them through their argument, if they really have one, and endeavour to ascertain their object and views, and especially what ideas they draw from Embryology, that science on which, in all probability, the future progress in Zoology mainly depends. The *formation of beings* is a question calculated to try the consistency of their opinions and their reconcile-

* Fleurens.

† Id.

ment with *facts*, for of these, thanks to Cuvier and the anatomical school, we have some. We need scarcely caution our readers that, on this subject, there can be nothing but hypotheses of the wildest character, but we stand excused for discussing them, seeing that grave men,* geometricians and mathematicians have not hesitated to put their names to, or at least to publish extravagancies as wild and untenable as ever came from the pen of Apuleius. Neglecting or despising the sage advice of Comte, to confine their speculations to the earth we inhabit, they have ventured on an ocean as vast as that into which plunged, according to our divine Milton, the author of all our woes, in virtue of which attempt, according to some, they are not unlikely to reap the same reward—the contempt and horror of mankind.

Spontaneous generation was hypothesis first. Aristotle admitted three modes of generation, Harvey one: “*Omne vivum ex ovo*,” was his strong expression. But Aristotle’s view extended even to our days, to Burdach, for example, who admits spontaneity of generation in certain fishes. It was whilst pursuing this inquiry that the extraordinary facts were made out, that certain animals could only receive their full development by being transported to different localities; that some, for example, remain in a vesicular or larva state in the tissue of an animal until this animal be devoured by another, when, seeking their way to the intestines of the animal, forming their new residence, they become developed, acquiring at the same time forms which had been long held to be perfectly independent beings, subject to no such transformations. A Belgian named Van Beneden claims justly the chief merit in these remarkable discoveries; but, notwithstanding their brilliancy, they do not much advance the question of the formation of beings; they rectify mistakes; they add another obstacle to the admission of the doctrine of spontaneous generation in any form—the question of all others the most curious, the most profound: Leibnitz cut the Gordian knot by referring the whole to a *miracle*,—in other words, he adopted the Indian theory, the best and safest; his view led to the hypothesis of the pre-existence of germs, ready formed, awaiting but the circumstances necessary for their development. Admitting the hypothesis, whence came the new species (unless we suppose that all were formed at first) which filled the world after the destruction of the old? The system was, notwithstanding, adopted by Bonnet and Haller, but the latter placed the pre-existing germs in the female, Leibnitz in the male. The immortal Cuvier himself leant to this doctrine, when he condescended to speak of things which could not be demonstrated. Does the following experiment throw any light on this mysterious question? “If a male jackal be united to a female dog, the product is a being half-jackal, half-dog; take this mongrel (*metis*) and mate it with a female dog; this time the product only represents the fourth of a jackal. Again unite this mongrel (fourth jackal) with a female dog; the product represents the eighth of a

* ‘On the Plurality of Worlds:’ by Baden Powell. ‘Are there more Worlds than One?’ by Sir D. Brewster.

jackal. Finally, this mongrel (the eighth of a jackal) with a female dog; the product has nothing of the jackal in it—it is a dog.”* It seems that, if the female jackal had been employed instead of the female dog, the last product would have been a jackal.

We confess that we do not see in such an experiment a refutation of the doctrine of the pre-existence of germs: the product reverted to the species which prevailed; but whether the germ pre-exist or not, it produces a being with generic forms, and these must have a meaning, a signification, it being admitted by all that the productive energy is limited to analogous species and genera. Buffon knew some of these facts, nevertheless he thought it right to offer another system of the origin of beings—the system of *organic molecules*. Voltaire alone could handle such systems; he struck them with a word, and they fell, like the card-constructed houses of children. Life is the most obscure of all mysteries: its results are beings with structures infinitely complex: in the analysis of these beings by observation and dissection we arrive at certain facts, of which the latest discovered are incomparably the most wonderful: they reveal to us the extraordinary and almost incredible fact that the embryos of all animals resemble each other; that, in the progress of the young from the ovum upwards, they assume forms belonging to other species and genera; that the young bird has branchia or gills, as well as lungs—the young fish, lungs as well as gills; that man himself is not exempt from these metamorphoses, which seem regulated by laws as constant and uniform as the specialization of the adult—metamorphoses and transformations as curious as those imagined by Ovid, and far more true. Any system or theory which takes not such facts into account is sure to be unsatisfactory and at fault, if not entirely untrue; they cannot, in fact, be any longer overlooked.

When we consider these facts of embryogeny, combining them with the obvious scale or chain of the animal creation, from the most simple to the most complex, running, as it were, in parallel lines, the reflection deepens, even though we may question that other view (successive creation) superadded to it in modern times by Paleontology, and which seems in course of being refuted. Nevertheless there are many respectable paleontologists, if we may so say, who still hold by the theory, for want, we presume, of a better—that animals have been formed and succeeded each other on this globe, in an order proceeding from the more simple to the more complex, repeating, as it were, the embryonic forms and metamorphoses, as well as the existing chain of beings. These facts, it is true, are not systems nor even theories, but they are the materials out of which future theories must be formed. The philosophy of Zoology must assume a character in unison with the precise mechanical, mathematical and experimental philosophy of the day. The era of ingenious conjecture is passed as regards human physiology and anatomy—it closed with the advent of the illustrious Bichât; as regards Chemistry, with Davy; Hutton

* Fleurens.

and Cuvier put an end to the conjectural in Palæontology and Geology, properly so called : it cannot be again revived, at least for a lengthened period. A cure for the nonsense of a 'Plurality of Worlds' and 'More Worlds than One' may be found any day in the first chapters of Comte. With Bichât and Cuvier closed the era of conjectural physiology and unsound anatomy. It were a waste of time to discuss such theories now, nor does it obscure in any way the grand reputation of Buffon, that he also committed himself to an hypothesis, a system. It was the fashion of his day, and neither the vortices of Descartes nor the hypotheses of Leibnitz and Maupertuis had been fairly withdrawn from the field of Science. But the phasis which zoological Science has now assumed (I mean, of course, in a scientific point of view) does not admit of this : it returns, as we shall find presently, to the grand views of Buffon, but with other objects and brighter prospects of success. That which we now seek for is, what gives the *form* ; the materials of life are found everywhere, and they undergo perpetual change, but the form remains, not for ever, but until their extinction by a cause as yet undiscovered. It is this tendency to specific form, originating in that which is either without form or possessing another, in which is concealed the mystery of life. An independent being which, for a certain time, maintains a certain form, and is considered as a distinct species, suddenly disappears, and seems to have been lost ; soon it is discovered in another locality under another form.* Who shall say how far this principle extends ? The germ, as Buffon said, contains the mould of the future being ; the poverty of language did not enable him to express this great truth in more suitable, more intelligible terms ; but that mould contains more than the outline of the *species*—it includes that of the family, the *genus* : how much more we know not. All that we know is, that, in the existing order of things, as in the past, specific forms exist which maintain their existence in space and time for an epoch ; that these were preceded by others which followed exactly the same course ; these by others. Let us adhere to facts. If in the embryo of the young and in its developments we find *generic* forms as well as *specific*,—the vestiges of the past also and an outline of the present world,—it is surely consistent with legitimate philosophy to inquire into the causes of such phenomena, and even to predict that these forms include the future. They form part and parcel of the laws of life, just as much as the phenomena of the movements of the planets form a portion of and corroborate the truths of the laws of gravitation. Bonnet mistook the laws of growth and nourishment, and he fancied that the molecules contributing to the growth of a bone were intercalated amongst the original, which thus never changed, but grew by a kind of intussusception. Experimenters, from Belchier and Duhamel to Hunter and Troja, have shown that it is not so ; notwithstanding, the expression of Buffon remains substantially correct : "The impress of the mould of each species is the thing the most un-

* Van Beneden on the Tænia.

alterable in Nature, whilst nothing is more variable, more corruptible, than the substance." In this expression we find the result, the *résumé*, of nearly all that zoological science has done; it states simply a fact, and read with the light which the 'Ossements Fossiles' has since thrown on it, tends still more to exalt the reputation of that man whose name, during the Cuvierian era, had all but ceased to live.

The grand generalization of Buffon was simply a lucid statement of a fact, but a fact of the highest signification; nothing is constant, he said, but the *mould*, the *form*, that is, the species throughout all its organs; alter it as you will, the *forms* or *moulds* in which Nature has cast her beings remain as they were—for ever; she alters and modifies them herself: the time was when there were other forms, other species, *other moulds*, and the time will arrive when a new order of things must take the place of the present; but how all this is effected we know not—all that we know is that man cannot do it: we may compress and torture the human brain by artificial means,* crush into a hideous mass the beauteous forms of the human foot for thousands of years,† still he cannot make his odious and detestable mutilations and deformations, hereditary. Hippocrates thought that man could thus alter Nature, but a larger experience tells us that he cannot do so permanently. Modern physiologists, much occupied with little details, offer you certain experiments on bones and on the production of hybrids, in proof that new forms may be created by man, but these very experiments prove the contrary. The hybrid cannot maintain its position on earth, and this is a proof, not that pre-existing germs do not exist, but that the principle of life, derived from the male, modifies that germ or mould for a time, bringing out certain specific qualities appertaining to one or other parent, and distinct and observable, and remarkable in the case where the parents belong to different species, the young of each species containing within it the possible of all its natural family. Thus, in hybridization, at least two principles are at work in each parent, the specific and the generic; forms are affected thereby; but all such deformities of Nature's moulds are notoriously fleeting and have ever been excluded from Nature's great plan. Naturalists also have experimented on living bones,‡ to know how they grow, whether by a kind of intussusception of the molecules or by the superimposition of layers, both in length and thickness: admitting to the full the correctness of their experiments, some of which, and those the most important, could be refuted by facts drawn from the practice of surgery, no other inference can be assumed from them than this,—that the regulating principle of the growth of the bone lies not in the bone itself, but in the surrounding soft tissues. That is all. The experiment enables us merely to localize the regulating principle of the growth or restoration, but throws no light on the nature of that principle itself.

The question we now discuss has in Britain occasionally assumed another form, perhaps for this reason, that sound zoological science

* Chenook Indians.

† Chinese race.

‡ Fleurens.

never really existed here. At no period was it ever strictly anatomical, experimental, practical, but vacillated as Philosophy itself has done (metaphysical, we mean), between the extreme of utter scepticism and the most slavish of doctrines—the theory of final causes. There never was any medium or middle course, for Science and common sense—it was ever Middleton and Tyndall on one hand or Paley and Croly on the other: men were called on to take a side—to stand by the Mosaic deluge or the ‘Vestiges of Creation.’ Continental scientific men look on with wonder, and ascribe it to the climate and to the temper of the islanders: a hypocrisy which has been called “organized,” but which must mean “organic,” has no doubt something to do with it. The question resolves itself into this,—is life an inherent quality of matter from the beginning, an essential to it, and requiring but certain circumstances to call it forth? This is a simple-enough proposition, perfectly intelligible and in every way probable; so soon as it has been demonstrated it will take its place in Science—but not till then.

A word in conclusion of this section of this brief critical inquiry into the present scientific phasis of modern physiology. If the doctrines of the metamorphoses of organs, in the sense given to the term by Etienne Geoffroy (St. Hilaire), ever made any progress in France, we are certain that, with few exceptions (remarkable enough, no doubt), they were never admitted by the transcendental anatomists of Britain; none of them ever believed that branchiæ or gills could be metamorphosed into lungs, or *vice versa*; that the opercular apparatus of fishes was the metamorphosed *ossicula auditus*; that the prostrate gland and the uterus were analogous or homologous; that the reproductive organs are identical in the embryo of either sex, and are convertible into each other by a law of sexuality applied to both sexes: no such doctrines ever made any progress in Britain. On the contrary, we know* that the whole doctrine was objected to so early as 1821, in the presence of Geoffroy himself, and in his own study; that again in 1827 and 1828 this pretended metamorphosis of organs, the refutation of which M. Fleurens claims in 1844, was distinctly refuted in a Memoir read before the Royal Society of Edinburgh, at that time under the presidency of Sir Walter Scott, and afterwards published in the ‘Medical Gazette.’ In that memoir the theory of *duplicate organs*, in the foetus, as a type of certain great systems of organs, is explained by a reference to these organs themselves; is supported by embryology, by the discoveries of Rathke, by a history of the ducts of Malpighi and Gærtner, and by dissections of hermaphrodite structures placed before the Society. The term, then, *dedoublement organique*† is not a happy phrase, for, in reality, there is no such thing in one sense, either anatomically or physiologically; the branchiæ of the chick are not the *doublure* of the lungs, nor the

* See ‘Great Artists and Great Anatomists,’ by R. Knox. London: Van Voorst.

† Fleurens.

swimming-bladder of fishes the *doublure* of the gills; they are distinct organs, which in the fœtus may or may not perform a function. M. Fleurens connects their presence with final, that is, mechanical and biological causes, and speaks of them as "constituting the apparatus of fœtal life." This we are compelled to deny as a general rule. The branchiæ of the fœtus in mammals and birds performs no such functions as he seems disposed to assign to them; nay, what is more, he must know that they do not: his theory, then, of "organs of fœtal life" and of adult life, has no basis in fact, unless he includes, or rather rests his doctrine on, those other organs, the corpora wolffiana, suprarenal capsules, &c., organs of whose true character we are still profoundly ignorant. The *doublure* and the *dedoublement organique* theory, then, which is here claimed* as a discovery in 1844, has no basis, if adopted as its author views it; but, separating fact from fiction, we find in it the doctrine of *type*, advocated in the presence of M. Geoffroy himself, and published in 1828, that is, twenty years prior to the appearance of the 'Mémoires d'Anatomie et de Physiologie Comparées.' It has often happened, that the substitution of a happier and more expressive phrase has resuscitated a theory which had been forgotten, and made that appear new which, in fact, was old: in the costume we now discuss the phrase proposed (*dedoublement organique*), it is neither correct nor happy; it is incorrect, in fact, as open to equivocation; type of formation was the one proposed by the anatomist† who first offered the theory to the world; it has at least the merit of implying no false views, being simply a generalization of a series of facts, which may be verified in the embryo—in the adult anatomically and physiologically. "The *type* or *plan of formation* of certain *systems of organs* is *double*; these *systems* are more especially the *respiratory* and the *reproductive*;"* lungs and gills are present in all, whether aerial and aquatic, not with reference to the fœtus as an individual, but with a view to the future, and to the grand scheme upon which all animals are constructed. If the future animal, when adult, is to be *aquatic*, the gills alone are developed and the lungs disappear; if *aërial*, the lungs alone acquire their full growth and the gills disappear; if *amphibious* (*Siren*, *Proteus*, *Axolotl*), both remain. These were the objections made to M. Geoffroy by the author‡ of this view, in 1821; they must no doubt have occurred to others. To refer these structures to pure fœtal purposes and uses is to go backwards in philosophical Zoology; it is no business of ours to trace the causes of such a retrograde step, but, were we inclined to do so, we should unhesitatingly ascribe it to a misapplication of the doctrines of a Final Cause; a misapprehension of the true principles of the transcendental philosophy, which, not being originally a native of France, but an importation from Germany, did not, in that country, meet with a fitting soil for its full development; and yet that country, abounding in genius and originality,

* Fleurens.

† Knox, 'Medical Gazette.'

‡ Id.

produced Buffon and Voltaire,—to the first of whom we owe the theory of primitive moulds, and to the latter an expression he applied to the physical world, far in advance of his age, “the laws of deformation are as constant as the laws of formation.”

R. KNOX.

Meissen House, Upper Clapton,
January, 1857.

Sagacity of the Rat.—Strange stories are often told about the sagacity of the common rat, and most people have heard of the method by which that animal is said to purloin eggs. The following is a true account of the way they defeat an ingenious contrivance of farmers:—A labourer on a farm at Tenterden, observing holes in the thatch of a corn stack, evidently made by rats or mice, was puzzled how to account for the intrusion: the stack being raised more than two feet from the ground, the plunderers must have entered by the roof. The mystery was soon solved: the man came the next morning, and saw a rat carefully balancing itself at the extremity of a branch of an elder tree about three feet from the stack, and crouching down ready to spring on to the thatch. I am told by those conversant in such matters that the raised stand does not protect a stack from mice, which are often carried in the sheaves from the barn, and need not leave their good quarters until the food is consumed. With rats, however, the case is different; they are obliged to go away in search of water; consequently, when the stack is raised from the ground, they cannot return. Our sagacious friends mentioned above were more fortunate; they could eat a passage through their abode, drop out at the bottom, quench their thirst, ascend the tree, and leap home again.—*S. C. Tress Beale; Ivy Court, Tenterden, January 26, 1857.*

Birds of the Crimea. By THOMAS BLAKISTON, Esq., Lieut., R.A.

(Continued from page 5421).

Sylviadæ.

In commencing at the beginning of this numerous family, of which I can name fifteen species as visiting the Crimea, and five of which are included in the Fauna of Britain, the first which I come to is the hedgesparrow (*Accentor modularis*), of which Dr. William Carte obtained a specimen in the month of February, and I killed another early in March.

I have no doubt that the Crimea would be a most interesting field for the naturalist, and, if well worked up, would throw much light on the range of British birds. The character of the country and its situation are peculiar: it is, in some measure, cut off from the mainland to the south and west; and although there is but two and a half degrees of sea separating it from Asia Minor, yet this may limit the

range of some of the winged tribes. One would therefore be led to consider it a turning-point for those which range to the north-east; but we could not deduce anything without observations being made in Western Turkey and the Principalities. However, should these scanty notes serve to clear up anything I shall be satisfied.

The robin or redbreast (*Sylvia rubecula*) is most likely a resident in the country, but not plentiful, or I should have observed it oftener than I chanced to do. This lively little songster our minds always associate with England, and I dare say that the thoughts of many a one who takes little or no interest in birds, on seeing him in a distant land, wander towards that island off the coast of Europe. My first meeting with him was during the armistice previous to peace: it was below the hermit's house, under the Monastery of St. George, on the 15th of February.

Both the redstart (*Sylvia phœnicurus*) and the black redstart (*Sylvia tithys*) inhabit the Crimea: the latter I have on the authority of Dr. William Carte, he having obtained a specimen in April: I observed the former as early as the 7th of March: they were in pairs by the 12th of April, remained during the spring, and were there at the end of September. I have a note of having seen what I thought was a redstart about the end of the first week in February. How could this be if it is only a summer visitor to Britain? *

The whinchat (*Sylvia rubetra*) I procured during the second week in May, and observed that it perched on bushes, at which time a white spot on the wing-coverts was distinctly visible at a distance: I noticed it till the 18th of May. Of this genus there are three more to be mentioned, two of which have not been found in Britain, the russet wheatear (*Sylvia stapazina*) and pied wheatear (*Sylvia leucomela*): I can say but little about them, having only obtained one of the former, which I found among rocks and scrub brushwood, in the middle of April, and the latter in the beginning of the last week of that month

* If in the present account I ask but few direct questions, it is not because I am not anxious to learn as much as possible about the habits or range of the species I enumerate, for I really feel a great desire to know more than, I am afraid, I ever shall on these points, as well as about other species inhabiting the locality of which I am writing; and I shall therefore be most thankful to any persons who will throw out hints, either in print or by letter, and I should take great pleasure in affording any information in my power in answer to questions concerning anything of which I make mention, for of course there are many details here omitted, such as the measurement of specimens, the precise dates of all those procured, &c., which may be useful or interesting to some. The simple address, as the paper is dated, will always find me, in whatever part of the world I may be serving.

and in May: they were all males; but, in company with the second specimen of *Sylvia leucomela*, I noticed what I considered was a female, which appeared of an obscure brown colour, with some dull white about the head. There were a good many about the rocky bare ground near the edge of the cliffs, under which I dare say they retired at night and in bad weather, for, during winter, I occasionally saw small birds make for the same retreat, which is well sheltered from the cold winds of the north and west, and in many parts there are also a quantity of small trees and bushes.

The wheatear (*Sylvia œnanthe*) is a bird of the migration of which much notice is taken in the South of England, whither it comes northward from France, Spain and Africa: we may also suppose that it makes its course to the Crimea about North from Asia Minor, as it has been observed at Smyrna, Trebizond and Erzeroum. One was shot by a friend of mine a few days before the end of March, and I observed a good many about before the middle of April: this, as well as the redstart, appeared to be in pairs; the male bird would mount in the air, almost like a skylark, uttering its note, which struck me as between that bird and the blackbird: they were rather shy of approach. The wheatear seems partial to hopping about old stone walls and the edges of precipices: it continued common until towards the end of September, usually only two being together, after which I took no notice of it. Feeling sure that the absence of any notes on the breeding of the birds here enumerated will be remarked, I may therefore state that I arrived in and departed from the country just at that particular season, and was therefore unable to make any observations concerning those interesting habits.

Of the warblers, more particularly so called, I can enumerate but a few as inhabitants of the Crimea, and in order will commence with the great sedge warbler (*Sylvia turdoides*), which I shot in company with the barred warbler (*Sylvia nisoria*), on the 10th of May: the latter, however, I had observed by itself on the 2nd (and it was plentiful in the middle of the month), about the brushwood on the hills; it would rise in the air for a short distance, in the manner of the wheatear, singing something like the skylark, which it also did when perched on the top of a thorn or other bush, at which time the crest was distinctly visible. Of three male specimens of this bird shot in May, the colour of the eyes were bright yellow, and not white, as has been described; in fact, so striking was this feature, that, not knowing the bird, I noted it in my journal as "yellow-eyed warbler;" the legs and feet were clay-yellow, marked with brown.

At the end of April, while out before breakfast one morning with my gun, my attention was attracted by the beautifully clear song of a bird, such as I had never yet, in my rambles during the spring, heard; it was sometimes so loud as to be considered quite close, and at others appearing at a distance, to so soft and low a warble would it fall; one part was very like that of a canary. I found very great difficulty in getting a sight of the bird among the high brushwood, for, on my approaching close, it would cease to sing, and sneak away; however, after a long hunt, I was fortunate in getting a shot at one, which proved to be a fine male blackcap (*Sylvia atricapilla*): there were two or three others about the same place, but I could not get a close sight of them. This bird was not uncommon during May, but was oftener heard than seen.

I obtained the common whitethroat (*Sylvia cinerea*) at the beginning of May, and it was generally distributed during the month, usually in pairs.

We end this interesting family by noticing the wood wren (*Sylvia sibilatrix*) and willow wren (*Sylvia trochilus*); the former, inserted on the authority of Dr. William Carte, I did not happen to meet with, but found the latter common and very generally distributed, from the 12th of April till the middle of May, after which I do not find a note of it, but think that it did not leave the country during summer: it usually kept about brushwood, and occasionally about small bushes on bare ground, and generally in pairs. I saw a good many among the bushes bordering the lower part of the Tchernaya river in the fourth week of April.

The goldencrested regulus (*Regulus cristatus*) was observed by Dr. William Carte, and he has a specimen which he obtained in the month of March.

Paridæ.

Of this family I can only say that I obtained specimens of the great titmouse (*Parus major*) and blue titmouse (*Parus cæruleus*) during winter and spring, and Dr. William Carte procured ten of the cole titmouse (*Parus ater*) in the month of February, and the long-tailed titmouse (*Parus caudatus*) in June.

Motacillidæ.

I have said before that unless one commences, in collecting, to pick up subjects the most common, it will be found that those which might at one time have been so easily procured are gone, and perhaps

another chance never offers, and ultimately information is wanting on most important points: from committing this error I lost opportunities of obtaining one or more species of black and white wagtails, and now, in endeavouring to throw together these few notes, I find myself deficient, not in the time of having observed these birds, but of the name of the species, and cannot tell whether it was the same bird observed in the Crimea in April and September, or during the winter at Scutari, when they were congregated. There may have been three or more species: I have, however, the pleasure of here recording the occurrence of two species for certain, which I was led to search for, from having seen a yellow-coloured wagtail while riding on the north side of Sebastopol Harbour to Fort Constantine. My next chance, two days after (for a day of duty intervened), I was up by sunrise, and away on my horse across the plain of Balaclava to the Inkermann valley, or lower part of the valley of the Tchernaya: I was very fortunate this morning, for I added to my collection four new species, and for the first time observed two of the Hirundines as well as two species of sandpiper. The two were the grayheaded wagtail (*Motacilla flava*), shot by itself, which proved to be a female on dissection, and the blackheaded wagtail (*Motacilla melanocephala*), a male in fine summer plumage; this was on the 24th of April. On no other occasion did I observe either of these, but Dr. William Carte procured a specimen of the first (*M. flava*) in April, and unluckily committed the same error as myself with regard to the black and white-coloured wagtails, which he often observed.

Anthidæ.

As in Britain, so in the Crimea, the meadow pipit (*Anthus pratensis*) must be a resident during winter and spring, if not for the summer and remainder of the year, as my first meeting with it was on the fourth day of the year, and I kept up a casual acquaintance till the second week in April, when, being out one morning on the hills near the sea, I observed small parties of birds continually coming north from the sea: I shot two out of distinct parties, one of which was the meadow pipit and the other the tree pipit (*Anthus arboreus*). This is the last note in my journal of having seen the former, but there is no reason why it should be put down as not resident in the country during the year, for I was but a single unassisted observer, and at best but a rough field naturalist. Although these two birds are said to have been so frequently confounded together, yet as soon as I picked up the first specimen of the tree pipit its appearance took my

eye, and I said to myself, "This is distinct from the former one;" and, on examining the two together, I observed a marked difference, but it will of course be asked, What was that difference? In answering this question, I must first say that the specimens compared had been just shot—they were fresh: I might then state that one was a trifle larger than the other, that there was a slight difference in the form of the beak, that the tertial feathers were not in the same proportion to the primaries, or that there was some difference in the markings of the breast and under tail-coverts; but these differences might not be constant during the year, and would not be observed, except by comparing specimens of each species, and would therefore be useless in the description of either species, and so I say that the great difference which struck me was that the meadow pipit had the legs and feet of a light brown, under surface of the feet yellow, and bill tinged with yellow; while the legs, feet and claws of the tree pipit were flesh-colour, and the base of the under mandible of the bill the same. I have, however, shot the former in England in November, with the legs and feet orange, but I cannot find that they are ever of a flesh-colour, like the tree pipit.

To Dr. William Carte is due the sole honour of bringing that rare bird, Richard's pipit (*Anthus Ricardi*) before the public as an inhabitant of the Crimea, a specimen of which, together with the remainder of his collection, is at the Museum of the Royal Dublin Society, and I have the satisfaction of being able to state that he will read a paper on the "Natural History of the Crimea" before the Society, on the last Friday of the present month (January).

I have two more, which must not be overlooked, for, being unknown as British, their names will not be so familiar to many readers. I did not notice the first, the tawny pipit (*Anthus rufescens*) until the 23rd of April, after which it was numerous and generally distributed; and, having observed it beyond the middle of May, I consider that it breeds in the country. I usually found it on open parts, sometimes bare and rocky, and one day I saw it catch a large insect, which I think, from having seen several about, was a species of grasshopper without wings; it perches on a twig as well as on the ground, where its movements are something like the wagtails, but its motion in flying is peculiar, and it utters a note like "Tee-twee:" I have noticed two chasing one another about a rocky hill for a long time, quite regardless of my presence. This bird will mount in the air in the manner of a lark singing, and come down very rapidly to the ground, with its wings considerably elevated above its back.

The other is the redthroated pipit (*Anthus rufogularis*), which I found among short rushes on a wet marsh on the 24th of April, when I shot two specimens: I did not observe it again. The bill was dark brown, lighter at the base of the lower mandible; hind claws curved, and about as long as the toe; eye hazel.

Alaudinæ.

In commencing the Conirostres, we come to a family of birds which, if not in species, is perhaps as numerous in individuals as any: with modern systematic authors it stands at the head of this second division of birds. I will here only speak of the species which I know have been observed in the Crimea, the first of which is the common sky lark of Britain (*Alauda arvensis*), which I observed in summer and autumn, but did not examine a specimen until January, which I found to agree with description.

The next is the wood lark (*Alauda arborea*), of which I have seen and compared a specimen, which was brought from the Crimea by an officer who made a small collection.

The only other British species, the shorttoed lark (*Alauda bruchydactyla*), which I obtained in Bulgaria in March, I considered that I observed while riding one day in the beginning of April in the Crimea; however, on the 21st of the month, I shot one out of a flock of about seven; they were common until the end of May, when I observed numbers on the plains north of Sebastopol. I never at any time saw more than seven or eight in a flock, which may be a peculiarity of the species. I have observed one perch on a plant about a foot off the ground, in which position I shot it. On examination of specimens, I found the shaft of the outer tail-feather white, and part of the inner vane of the same colour as the outer; the outer vane of the first primary buff-white, the tertials varying from half an inch short of to level with the end of the closed wing; first and second quill-feathers equal and the longest; and the brown patch on the side of the neck usually distinct, which is well shown in Yarrell's woodcut, but omitted in the written description. I have the third wing-feather of a male specimen, killed on the 18th of May, which shows a marked difference of colour in the half-inch extending beyond the fourth feather, clearly proving that the sun and weather affect the colour of the feathers of birds to a certain degree.

In November I considered that I saw a lark with a decided crest on the high land above the Bosphorus, in Turkey; and Lieut. Irby

includes *Alauda cristata* in his 'List of Birds observed in the Crimea' (Zool. 5353).

I ask any naturalist, Is there any pleasure in for the first time observing a species new to you? Surely you have a peculiar feeling within you,—you eagerly wish for a specimen,—and I will answer for it that you do not rest until you have obtained such. Suppose that you are a field ornithologist, you take the first opportunity, and although the weather is cold and windy, with snow covering the ground, you trudge off with your fowling-piece to where you observed the birds. I did this on the 2nd of January, and found the bird I was in search of on the Karani Hill, within sight of Sebastopol: I soon procured a couple, and, after waiting in the snow behind an old bit of a wall for some time, knocked over six more at a shot: they were larks, but the largest I had ever seen. I had studied Yarrell well, while making out the shorttoed lark. What could they be? To make sure, however, I turned over the leaves again that evening in my hut: they were not there. I was at a loss; "however," said I to myself, "they are larks, but somewhat approaching the buntings:" so I marked them in my journal as specimens of "large lark," and noted the measurements and other points. This was the calandra lark (*Alauda calandra*), as I afterwards learned, from England.

A few days after this, the 5th of January, I was again on the *qui vive*, as a friend told me he had seen some buntings, white below and rusty-colour above: with this hint I made for a camp where he said some had been shot, the ground being covered with snow, and sure enough, on looking over a heap of small birds, I found the calandra lark, common bunting, and another new to me, which I put down, for distinction, as a "lark bunting, No. 20," the skin as well as the sternum of which I preserved. The same officer, a day or two after, kindly sent me a specimen of the same bird, the whitewinged lark (*Alauda leucoptera*), a male, from which I penned the following description at the time:—"Length $7\frac{5}{8}$ inches; closed wing $4\frac{1}{8}$ inches. Legs, toes and claws brown; bill horn-colour, darkest above and at the point; upper mandible overhanging the lower $\frac{1}{7}$ th of an inch; top of the head and ear-coverts chestnut-gray; the feathers on the back dark brown, centres with light edges; lesser wing-coverts, bastard wing and primary coverts chestnut; secondary wing-coverts and tertials reddish brown, edged with light; primaries and secondaries dark brown—the third, fourth and fifth of the primaries tipped with light red-brown, the remainder white inner webs—all the secondaries tipped, for three-fourths of an inch, with white, which is not seen when the wing

is closed; upper tail-coverts chestnut and light brown, with the shafts dark brown or nearly black; one outer tail-feather on each side white; outer web of the next edged with the same, the remainder dark brown, edged with light, except the two centre ones, which are dark brown; centres with light chestnut-brown; outsides lightest at the tips, and appear only as extended coverts; all the under surface of the body white, slightly spotted on the throat and breast with wood-brown, inclining to chestnut on the breast; feathers on the flanks white with brown centres, forming longitudinal streaks; the feathers on the legs brownish white; first and second quill-feathers equal and the longest. Bill thicker, and the ridge of the upper mandible more curved than in the true larks; hind claw quite straight, except the white point, which is slightly bent; in front and rear of the eye is white; feathers on the head capable of being erected as a crest." I have a specimen in my possession which is somewhat darker in colour, the top of the head being quite a decided chestnut. I never observed or heard of this species again: on my return to England, Mr. Gould kindly made this bird out for me.

I was told that the calendra lark bred in the country, and I observed it numerous on the plains to the north of Sebastopol, while riding to the Alma, at the end of May, when it was in pairs: I several times observed a hollow in the sandy earth (from which the birds rose) but no eggs, which may have been only basking-places.

Emberizinae.

The family of buntings, which stands between the larks and finches, and, to a certain extent, partake of the characters of both, is a numerous and well-defined collection of species, which, although so common in many parts of the world, are by casual observers confounded with the finches or sparrows. It is often the beautiful yellowhammer, in his subdued winter plumage, that is seen hopping about the farmyards of England, in company with the sparrow, when he is driven by snow to the habitations of man for his support; yet how few would say that he is the most gaudily-plumaged bird of Britain at other seasons? It was in this state of plumage that the yellowhammer (*Emberiza citrinella*) was seen in the Crimea, my first meeting with it being at the end of December; but I was uncertain as to the species, on account of the very slight descriptions usually given of the winter plumage of land birds which inhabit Britain also during summer: it continued with us through January. Specimens were obtained by Dr. William Carte in March; and I observed either it or the ortolan bunting (*Emberiza*

hortulana) on the 6th and 12th of April, for this latter species having arrived about this time, together with the chirping of the common bunting, my ear was confused as to sounds. However, my first capture of *Emberiza hortulana* was on the 20th of April; for, on coming into camp from a ride, I observed a pair of birds which I took for yellowhammers, but something hinted to me that I ought to make sure; so, fetching my gun, I shot one, which, on examination, turned out not to be my old friend of the cold season, but a new one, the ortolan bunting, which remained common in pairs to the middle of May, and, I suppose, the whole summer. A male specimen, shot on the 2nd of May, had a portion of its ear-coverts, on one side, a green-olive. Now, I had observed the bird just mentioned for some days in pairs, previous to my shooting the specimen, and, considering they were of the former species, I had made the following note in my journal:—"Sunday, April 20th. It is seldom that I get a sight of these birds now, and what I do are in pairs: I suppose that the mass have gone north, but a few remain to breed." I insert this to show how one is liable to be led astray by the gradual substitution of one species for another, until by chance suspicion is roused; and therefore I advise any one who would make full and accurate notes (for truth is the greatest point in Natural History) not to hesitate about the killing of a few birds or the expenditure of a little additional ammunition, for the sake of being certain, for many birds are not unpalatable, and I have found buntings and others very acceptable to make a change from ration-beef and salt-pork. I also find, on the 26th of April, a reference to the note of this bird:—"I think they must just have arrived, for the note is distinct, and I should have noticed so many of them before."

The meadow bunting (*Emberiza cia*), which is said not to go north of the South of Europe, Dr. William Carte obtained in February.

The common bunting (*Emberiza miliaria*), known by its peculiar prolonged chirp, is resident in the Crimea during the year, but I consider that its numbers are greatly increased in the spring: I observed them in small flocks during autumn; a few congregated with other buntings and larks in winter, and scattered about usually among the brushwood on the hills in numbers during spring. I note two out of many which I measured, which appear unusually large, "Shot on the 7th of January, length $7\frac{1}{2}$ inches, closed wing 4 inches; and on the 12th of April, length $7\frac{3}{4}$ inches, closed wing 4 inches."

Lieut. Irby mentions *Emberiza schœniclus* as "common, and seen throughout the year."

Fringillidæ.

The house sparrow (*Fringilla domestica*), which may be seen everywhere in England, from the crowded streets of cities to the most remote farm-house, is an inhabitant of the Crimea, where I compared a couple of specimens. The Russian soldiers on the north side, during the spring of 1856, had a great number of small boxes erected on long poles in their batteries and about other places, for the accommodation, as I supposed, of this social bird, as I never saw any other go into them; but I never made out whether these boxes were for catching the young, or merely as accommodation for the sparrow, put up from disinterested motives.

Two chaffinches (*Fringilla cœlebs*) were shot from a congregation of small birds in mid-winter, which I immediately examined: I also saw this bird in May, and Dr. W. Carte brought home a specimen.

In company with a flock of yellowhammers, I shot a brambling (*Fringilla montifringilla*), on the 3rd of January; also another the next day, which was skinned and preserved.

The greenfinch (*Fringilla chloris*) was procured by Dr. W. Carte and myself during winter.

On Christmas day I saw a hawfinch (*Fringilla coccothraustes*), which had been killed a day or two, and, during the cold weather of January, procured one myself, which I had some difficulty in approaching.

Of the division *Carduelis*, the two well-known British species were obtained, the goldfinch (*Carduelis elegans*), by Dr. W. Carte in January, and myself in the middle of April, and the siskin (*Carduelis spinus*) during winter and spring, till after the middle of May; so we may be led to suppose that both breed in the southern part of the Crimea.

On the 22nd of April I observed a number of what I took for a species of redpole, with the pink breast showing on some of them.

I shot two females of the common linnet (*Fringilla cannabina*) on the 5th of January, one of which came to England, and is now among my other specimens of birds from the Crimea and Bulgaria, between sixty and seventy, in the Museum of the Royal Artillery Institution at Woolwich, where any one is at liberty to examine them.

The bullfinch (*Loxia pyrrhula*) was obtained by Dr. W. Carte: the specimen, being a very fine one, is among his others in the Museum of the Royal Dublin Society.

Corvidæ.

Having glanced over the hopping birds, we now come to those which move on the ground in a different manner, namely, by alternate steps with either leg, like man, and perhaps this is as clear a distinction as could be drawn. It may be seen that these birds pass on to the creepers, which, in like manner, approach what may be called the runners, Gallinaceous, or poultry birds, and I think the difference will be clearly understood when we look at the stately walk of the crow or starling, compared with the crouching run of the partridge; however, in mentioning the partridge as an example, let it not be understood that it always crouches when running, for you will see that a wounded bird, when making off from the dogs or yourself, carries its head as high as possible, and steps out at an amazing pace; but I mean that, in a natural and undisturbed state, it moves about by a sort of run in a crouching position; but enough of generalization.

The common starling (*Sturnus vulgaris*) breeds in the neighbourhood of Sebastopol, where there are many very convenient situations, such as the high cliffs and ruins at the gorge of Inkermann: I find no note of having observed them during the winter, but they were about the first week in April and in the second week gave signs of nesting, at which they were in full work at the end of May; and in returning from a ride to the Alma, I observed one carrying food into a hole in a bank, on the last day of the month. I have always considered that starlings are most interesting birds to observe, and those who have never read Stanley's beautiful description of their habits will do well to do so.

We now notice a bird by no means common in England, the rose-coloured pastor (*Pastor roseus*): it is a summer visitor to the Crimea; the first flock which I heard of in 1856 was about the middle of May, and I observed a large congregation before the end of the month, and by the end they were in flocks about the Inkermann cliffs, apparently going to build: of their stay towards autumn I have no notes, but a specimen was shot by me out of a small flock on the last day of June. A good many specimens of this attractive-plumaged bird came to England from the country.

The crows are birds which, not being shot by the sportsman as game or attractive objects for the cabinet, nor by the fowler for food, are therefore not often closely observed, unless shot by any one for that purpose. From this reason a resident naturalist does not happen to have rare species brought to him by others as singular or handsome birds, on account of their not appearing distinct from others of the same family at a distance, and therefore, as I never chanced to shoot any of them myself in the Crimea, I cannot speak of them with any certainty.

I occasionally used to observe what a friend, somewhat knowing in birds, and myself used to consider, from its hoarse croak, to be the raven (*Corvus corax*), and I have no doubt in my own mind that it was; and I should think it very probable that this bird breeds in the rocky and wild parts of the Crimea.

Of the carrion crow (*Corvus corone*) and hooded crow (*Corvus cornix*) being inhabitants there can be no doubt, for, from their well-known appearance and habits, I think the youngest observer could not help being satisfied. I did not observe many of these birds during the summer, perhaps on account of there being no sandy beach or flat mud coast near, where one would be likely to find them: through the winter they were numerous, and often a good many would be collected on the site of a summer camp, where they would pick up a good deal of scattered barley and other leavings; on such occasions they were often in company with gulls and jackdaws, and it was amusing to see gulls chasing both hooded crows and jackdaws on the wing, but I never chanced to see the operation reversed, the first always appearing to be the strongest. I have observed gulls feeding in company with hooded crows on dead animals.

During the winter I used frequently to observe flocks of jackdaws (*Corvus monedula*) go over the camp in the morning, and they were numerous during the spring and beginning of summer, and must have reared their young about the cliffs. In the beginning of May I observed, what I noted at the time, a white ring was plainly visible below the gray on the neck of one bird; this was at about thirty yards' distance.

The magpie (*Corvus pica*), of which a specimen was procured by Dr. W. Carte, I observed during summer and spring, but never numerous as a species.

The jay (*Corvus glandarius*) was by no means uncommon during the winter, when, as in Britain, it ranged the woods in parties: I observed no peculiarities in the specimens examined, and Dr. William

Carte has carefully compared his with specimens procured in Britain.

THOMAS BLAKISTON.

Camp, Woolwich, January 24, 1857.

Notes on a Female Brambling (*Fringilla montifringilla*).—This specimen was shot in the month of February, when in company with chaffinches, in the neighbourhood of Shanklin, Isle of Wight. Length 6 inches: chin white; throat ferruginous, as well as the breast, which is tinged with orange and pale red; a patch of bright lemon on the sides and beneath the wings, the feathers on the spurious wings being tipped with orange; there is also a patch of light chocolate about the vent, which, being in strong contrast to the white of the abdomen, is very remarkable; there are also longitudinal dark hair-brown spots on the feathers between the vent and thighs, as well as on the sides; the quills are, for the most part, margined with yellow on the outer webs, as are the tail-feathers, more particularly the two centre ones, which are ash-gray on the outer webs, dusky black on the inner; from the fourth to the ninth quill inclusive there are white spots on the outer webs near the shafts, forming, when the wing is extended, a slight bar across it, most of the white being concealed by the primary coverts; the third quill is longest, the first and second are about the same length, the fourth an eighth of an inch shorter than the third. It is not my intention, nor is it necessary, to enter into a minute description of the plumage of the brambling, my object being merely to show in what respect the specimen under examination seems to differ from those mentioned by ornithologists about to be referred to, although I am aware that much variation is said to exist in the plumage of individuals of this species. As my remarks are exceeding the limits I had proposed to myself at their commencement, I shall not venture to give lengthened extracts, as the authors about to be cited can be consulted, if required. Cuvier, in a masterly manner, at once points out what is most remarkable in the plumage, namely, the patch of lemon-colour beneath the wing, which I had in vain sought for in the descriptions given by other naturalists; but neither Cuvier nor any other author that I have been able to refer to says one word about the peculiarly striking patch of pale chocolate near the vent.

Cuvier, 'Règne Animal,' tome i. p. 386:—"Poitrine fauve, le dessous de l'aile d'un beau citron."

Temminck, 'Manuel d'Ornithologie,' tome i. p. 360:—"La femelle devant du cou et poitrine dun roux orange clair."

Pennant (quoting Mr. Johnson):—"The throat is white, the breast and belly waved with flame-colour. At the setting on of the wings, gray."

Montagu, 'Supplement to the Ornithological Dictionary':—"Female. Chin and throat dirty white: upper part of the breast crossed by a band of dull chestnut, above which the feathers are pale, tipped with dusky, giving a speckled appearance to that part; the rest of the under parts sullied white." In describing the male (in the 'Dictionary') he states that only "on three or four of the primaries a spot of white runs through the whole of the exterior web."

Macgillivray, vol. i. p. 336:—"Female has the throat and breast light reddish brown, the sides paler and unspotted, the abdomen and under tail-coverts brownish white. The third quill longest, the second scarcely shorter."

Stark (quoting Selby), 'Illustrations,' pl. 54, fig. 8:—"Throat, front of the neck,

breast, scapulars and smaller coverts of the wings, orange-red; a narrow orange transverse band on the wings; rump and lower parts white; flanks reddish, with black spots."—*Henry W. Hadfield; Tunbridge, February 2, 1857.*

Occurrence of the Hooded Crow (Corvus cornix) in Derbyshire.—Mr. J. J. Briggs notices (Zool. 5363) the rare occurrence of the hooded crow in Derbyshire. It may be interesting to Mr. Briggs and the readers of the 'Zoologist' in general to know that, for the last five or six years, a pair of hooded crows have frequented the parish of Breadsall, near Derby, during the autumn and winter months. Last winter a beautiful pair were killed in the parish, and I had them preserved by Mr. Cook, bird-stuffer, of Derby. They were replaced by another pair this autumn, 1856.—*H. Harpur Crewe; Stowmarket, Suffolk, January 19, 1857.*

Note on the Robin (Sylvia rubecula) and Butcher Bird (Lanius collurio).—A few Sundays ago, as I was sitting in the vestry between the services, I amused myself with watching a robin, which had taken refuge in the church from the snow. It presently came and sat on a form close to me, and I saw it eject from its mouth a small dark pellet; this I immediately picked up, and found it to consist of the exuviae of blue-bottle flies, with two small gravel stones in the centre. I was not aware that the robin was in the habit of throwing up in pellets the exuviae of the insects upon which it feeds, or any of the indigestible materials which it may take with its food. I have an idea that it is not generally known that the common butcher bird casts up pellets; but that such is the case I had a very interesting proof some few years since. A pair of butcher birds built and reared a brood of young ones in the rectory grounds at Breadsall. After the young birds had flown, the male bird was shot at and winged. We put him into a cage in a summer-house in the garden, and fed him with raw meat, which he ate readily. A day or two afterwards we were astonished to find, lying at the bottom of the cage, a number of large pellets, composed of the wing-cases and other exuviae of beetles, &c. As we had never given him anything but meat or worms, we could not at all account for it. We continued to find the pellets every day, and at last determined to watch, and, having done so, found that the old hen bird regularly fed her mate with beetles and other insects. She continued to do this for a long time, when, his wing having recovered, we released him.—*Id.*

Occurrence of the Firecrested Regulus (Regulus ignicapillus) near Penzance—I examined a female specimen of this regulus a few days since, which was captured within half a mile of this town, having the crown crest lemon-yellow, and the cheeks smoke-gray. I think these characters pretty well denote a bird of the year, for I have reason to think that the crest of the adult female of this species exhibits, more or less, a mixture of orange-red with the yellow, which, in *Regulus auricapillus*, is always lemon-yellow.—*Edward Hearle Rodd; Penzance, February 3, 1857.*

Note on the Common Wren.—As Yarrell writes of the wren (*Troglodytes vulgaris*), that it often endures a frosty winter's night by uniting and roosting in company in some sheltered hole of a wall or under thatch, it may be interesting to the readers of the 'Zoologist' to know that, for some time past, wrens have occupied empty swallows' nests, under the eaves of a house inhabited by a lady, residing in Tenterden, whose love for the feathered race and appreciation of all the works of Nature have not permitted these nests to be destroyed. On approaching a window near which the nests are built, shortly before sunset and again early in the morning, wrens have been seen to quit the nests.—*S. C. Tress Beale; Ivy Court, Tenterden, January 26, 1857.*

Abundance of Wagtails.—Observing an article on the great abundance of the pied wagtail (*Motacilla Yarrellii*) in the 'Zoologist' (Zool. 5363), and having paid some attention to this and the allied species, *M. alba*, for some years, is my reason for offering a few remarks on the subject. I would advise Captain Hadfield, the next time he meets with such a flock, to kill a few of the lighter-coloured birds, more particularly those that fly into trees, and he will probably find himself in possession of *M. alba*. The latter appears here in spring and autumn, and is to be met with in ploughed fields or gardens: should you see one and start it, on rising it often appears to fly over a hedge-row, but, if you watch it closely, you will generally find it in the hedge-row, and often perching. I have never met with or heard of its breeding in this neighbourhood; but I have taken two nests of eggs in Whittlesea Fen, in Huntingdonshire: one nest was in a reed stack, the other was in a mound of peat that had been thrown out of a drain; I also found a third nest under the end of a plank laid across a drain as a temporary bridge: with this I was unfortunate, although I watched it for several days, for, on the day I intended taking it, it had been unfortunately discovered by some children and destroyed. Although I have frequently looked for it, I never met with *M. alba* in the winter season, but *M. Yarrellii* is to be seen any fine day in winter running on the banks of rivers and brooks. On a winter's day, while fishing in the Trent, it has often pleased me to see *M. Yarrellii* running within a few yards of me, and I have as often looked in vain for *M. alba*; but perhaps *M. alba* changes its plumage in winter? Can any ornithologist answer this question?—*Samuel Carter*; 20, Lower Moseley Street, Manchester, January 30, 1857.

Notes on the Great Bustard.—I have lately been enabled to obtain a few particulars with regard to the habits of the great bustard (*Otis tarda*), as observed in this neighbourhood, which may prove interesting to some of your readers: I have derived this information from the dealer by whom the specimens of this noble bird formerly in the possession of Lord Derby, and those at present in the gardens of the Zoological Society, were furnished. He tells me that, notwithstanding the increasing demand for both eggs and the birds themselves, they are still very numerous distributed over the whole of the flat country surrounding Leipzig, more especially so in the vicinity of Halle; and, from their shy habits, and the facility of perceiving the approach of an enemy afforded them by the nature of the country, which, for miles upon miles, is unbroken by hedge or wall, there is every reason to suppose that a long period will elapse before the species be thoroughly extirpated. The eggs are usually laid towards the middle of June, and are invariably deposited in the most sequestered part of a field of grain or clover, sometimes in a hole scratched in the earth, but more generally without an attempt at a nest of any kind. There can be no doubt that numbers annually hatch out their broods in safety, for the finding of the eggs must, of course, be purely accidental. The number of the latter is usually two, but instances occur nearly every season of three being laid; this, I believe, has also been observed in our country, for, if I remember rightly, one or more of the nests found about twenty years ago in Norfolk contained three eggs. These are sold by the dealer I have named at the price of one shilling for a fresh egg, and half-a-crown for one that has been sat on for some time: those in the latter condition are, immediately on their being obtained, wrapped up in wool and sent to different parts of Holland, in which country there seems to be at present a mania for rearing these birds; Herr Richter, however, seemed to have but a faint opinion of the skill employed by the receivers, and informed me that in very few instances were the young produced, and that, when this was the case, they

seldom lived long. In autumn the members of the species are greatly increased by arrivals from other parts of Europe, and at this time many are shot in the great annual bunts which take place in September and October, and, what is rather remarkable, birds of the year are but seldom obtained. Richter has had through his hands during the past season about thirty eggs, every one of which were sent to Amsterdam; my wishes to procure specimens were therefore frustrated.—*Henry Smurthwaite*; 8, *Rosslatz*, *Leipzig*, January 8, 1857.

Rare British Birds in Germany.—Towards the latter end of September I picked up, whilst crossing a fallow field, a beautiful adult male specimen of a rare British bird, the crested lark (*Alauda cristata*); it was perfectly fresh, and I could find no wound about the body: I have since seen this bird twice in the vicinity of Leipzig, and am told that it is by no means rare in the breeding season. A few days ago I had the pleasure of seeing, in the cabinet of a collector in this town, a remarkably fine specimen of the egg of the great auk (*Alca impennis*): in common with most eggs of this species, its origin is shrouded in mystery; it was brought, about eighteen years ago, from Iceland by a sailor, and sold by him to an ornithologist in Hamburg, from whom it was received by its present owner: from what part of Iceland, however, is unknown, as also are all particulars with regard to the circumstances attending its discovery: it is a very fine, perfect specimen, blown with a hole in each end, but these are not so large as at all to destroy the symmetry of the egg: it is also very richly and strongly marked: I had previously only seen the fine example in the collection of Mr. John Hancock, of Newcastle, but, having heard descriptions of several others, I am inclined to think that the secondary colour in the specimen I am describing is much browner than usual; this may perhaps arise from partial exposure to light and the length of time which has elapsed since it was taken: the person to whom it belongs wishes to sell it for £15, and, as I am informed that the one belonging to the late Mr. Yarrell, which was slightly cracked, was bought at the recent sale for £21 10s., this appears to be no unreasonable price; a professor of Zoology in Dresden and a Scotch gentleman, whose name I could not learn, have each offered £8 for it, but this sum the owner thought proper to decline. The white stork (*Ciconia alba*) breeds on the outskirts of Leipzig: a nest exists at present in the Rosenthal, a pleasant walk within the gates of the town; it is placed on the summit of a tree, about twenty feet high, and seems to be firmly constructed, as it has resisted with success all the severe storms with which this neighbourhood has been recently visited: another nest, a most interesting object, is built on the roof of a village inn, about one mile from here: from the fondness with which the birds are regarded by the peasantry, eggs are difficult to obtain; I have succeeded, nevertheless, in procuring good specimens, together with those of other rare British birds, such as the common and little bitterns, black redstart, white wag-tail, &c. Since writing the above, I have had the satisfaction of seeing no less than five crested larks in the open street, before the house in which I reside: they were exceedingly tame, and allowed me to approach within a few feet without showing any symptoms of fear: from their plumage they appeared to me to be all males of the past season: the speed with which they run is really remarkable, far exceeding that of any other small bird with which I am acquainted. I may add that the shorttoed lark (*Alauda brachydactyla*) is not uncommon, and also breeds in this part of Saxony. The collection which contains the above-mentioned egg of the great auk may fairly vie with almost any of our most celebrated British cabinets, and the opportunity which I have had of inspecting it has afforded me the greatest pleasure: were I to give a list

of all the rarities it contains I should be thought tedious: I may, however, mention that, in addition to the noble specimen of *Alca impennis*, there are also examples of the golden eagle (*Falco chrysaëtos*), eagle owl (*Strix bubo*), all the rare British warblers, five crested regulus (*Regulus ignicapillus*), shore lark (*Alauda alpestris*), shorttoed lark (*A. brachydactyla*), pine grosbeak (*Loxia enucleator*), crossbill (*L. curvirostra*), white-winged crossbill (*L. leucoptera*), nutcracker (*Nucifraga Caryocatactes*), great black woodpecker (*Picus martius*), bee-eater (*Merops apiaster*), crane (*Grus cinerea*), a beautiful series of the eggs of the little ringed plover (*Charadrius minor*), Bartram's sandpiper (*Totanus Bartramii*), and a great number of others of excessive rarity: all these have been most carefully identified, and are in excellent preservation. The egg of the nutcracker being so little known, it may perhaps not be out of place to observe that the specimen I have examined bears great resemblance to that of the jay (*Corvus glandarius*); it is, however, somewhat smaller, and the ground-colour is more uniform than in most eggs of the above-mentioned bird, being also strongly marked in various parts by thick waving black lines; it has a peculiar character about it, by no means easy to describe. The egg of *Totanus Bartramii* is found in North America, and more like those of the greenshank than of any other bird with which I am acquainted.—*Id.*

Occurrence of the Avocet (Recurvirostra avocetta) and Rosecoloured Pastor (Pastor roseus) near Rochester.—An avocet was shot in the marshes near Rochester, about five weeks ago: it is now in my possession. I have also a rosecoloured pastor, which was shot in Frindsbury, near Rochester: it was shot in the summer, in a cherry-orchard out of a flock of starlings.—*C. W. Shepherd; Trotterscliffe, Kent, January 26, 1857.*

PROCEEDINGS OF SOCIETIES.

ENTOMOLOGICAL SOCIETY.

January 5, 1857.—W. W. SAUNDERS, Esq., President, in the chair.

Donations.

The following donations were announced, and thanks ordered to be given to the donors:—‘Entomological Papers,’ by John Nietner, Nos. 3 and 4; presented by the author. ‘Revue et Magasin de Zoologie,’ 1856, Nos. 10 and 11; by the Editor, M. Guérin-Ménéville. ‘The Journal of the Society of Arts’ for December; by the Society. ‘The Literary Gazette’ for December; by the Editor. ‘The Athenæum’ for November and December; by the Editor. ‘A Manual of Butterflies and Moths,’ No. 11; ‘Elements of Entomology,’ No. 4; ‘The Substitute,’ Nos. 7, 8, 9, 10 and 11; ‘The Entomologist’s Annual’ for 1857, Library edition; by H. T. Stainton, Esq.

Election of Members, &c.

The Rev. D. J. Drakeford, M.A., Churton Mendip, Somersetshire, and H. S. Digby, Esq., Fenstanton, St. Ives, Huntingdonshire, were balloted for and elected Members of the Society.

Edward William Robinson, Esq., 42, Harneson Street, Kentish Town, was balloted for and elected a Subscriber to the Society.

Exhibitions.

Mr. Stevens exhibited a box of Lepidoptera, chiefly Pyralidæ, taken at Sarawak by Mr. Wallace, amongst which was a beautiful species of *Cerura*, allied to *C. litura* of India; a singular *Bombyx*, allied to the *Megasoma pardale* of Java; and several Pyralidæ, remarkable for the extraordinary development of the palpi, in one species the terminal joint of the palpi being turned back over the head of the insect, and equal in length to the abdomen.

Mr. Hunter exhibited, on behalf of Mr. Reading, of Plymouth, four living specimens of *Carabus intricatus*, recently found in moss in that neighbourhood; and a specimen of *Glæa erythrocephala*, taken on ivy blossoms, in November last, at the same place, being the second recorded British specimen of that species.

Mr. Smith read an extract from the 'Entomological Magazine' for 1837, in which Mr. Shuckard recorded a specimen of *Carabus intricatus* sent to Mr. Smith amongst a large number of Carabi, collected on Hawley Flat, near Blackwater, Hants, and Horsley Downs, as stated by Mr. Shuckard. Mr. Smith had frequently searched the locality without success, in May and June; but, not knowing the habit of the species, had not thought of hunting for it in the wood which skirts the south-east end of the locality.

Mr. Waterhouse said Mr. Digby had informed him that he found this species in Germany, in the moss and rotten wood on the stumps of trees which had been cut nearly level with the ground.

Mr. Stevens remarked that he had searched for this species in June in the localities in Devonshire, mentioned by Dr. Leach, but without success.

Mr. Wollaston said the natural habitat of the species seemed to be in moss during the winter; it probably would be more frequently found, if searched for at that season.

Mr. Stevens exhibited a most beautiful *Callithea*, taken by M. De Gand at Talinza, in Peru; and a *Curculio* from Burmah, allied to *Pachymerus*, having very remarkable hind legs.

Mr. Waterhouse observed it was a singular fact that four or five Brazilian species were closely allied to this Indian insect.

Mr. Wollaston exhibited a large box of minute Coleoptera, being a portion of his captures during his last visit to Madeira.

Mr. Lubbock called attention to a remarkable paper lately published by Professor Siebold, entitled 'Wahre Parthenogenesis bei Schmetterlinge und Bienen,' containing some extraordinary theories on the generation of bees and other insects: he stated that an English translation of the work would shortly be published.

The President read an extract from a letter addressed to Mr. W. Marshall by Mr. Monteith on the reported capture of six specimens of *Pieris Daplidice* near Glasgow.

Mr. T. V. Wollaston read a paper on the British Atomariæ, in which twenty-three species are described as natives of this country.

Mr. Pascoe read a paper on Longicorn Coleoptera, being a continuation of that read by him at the Meeting in March last.—E. S.

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